THE BRYOLOGIST

JOURNAL OF

THE SULLIVANT MOSS SOCIETY

VOL. 48 MARCH, 1945 No. 1

LICHEN DISTRIBUTION IN CALIFORNIA

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It has long been recognized that of all the forty-eight states California has the largest and most diversified number of flowering plants. The seventh edition of Gray's "Manual" gives 3413 native species occurring within the area east of the 96th meridian, north of the southern boundaries of Kansas, Missouri, Kentucky, and Virginia, and south of the 48th parallel, but also including Nova Scotia, New Brunswick, Prince Edward Island, and the greater part of Quebec and Ontario. This is an area vastly greater than that of California, for which Jepson's "Manual" gives the still larger number of 3727 native plants. Both these lists have been added to since their publication, but their relative status is not materially changed.

In the Fink-Hedrick "Lichen Flora of the United States" I find 1501 described species and varieties, after eliminating certain genera and species which belong to the fungi, or which (like *Amphiloma*) I cannot recognize as lichens. The names of 153 more are "reported," but are not described. Hence they are not reckoned in this comparison, even though it is certain that some of them are perfectly valid species. I now have records, either published or in typewritten lists of species recently determined for various correspondents, of 794 species and named varieties thus far known from California. This is a larger number than is known from any other state at this time. Henry Willey found nearly 500 species and varieties in the vicinity of New Bedford, Massachusetts. Bruce Fink believed that Minnesota contained 700 "forms"; this would include many of lesser rank than variety, as in his "Lichens of Minnesota" he gives but 410 species and varieties. Dr. H. E. Hasse gave 427 species and varieties in his "Lichen Flora of Southern California"; various supplements increased

this to 475. This is a larger number than has ever been published for any state, unless it is Henry Willey's New Bedford list, and is from an area of approximately one-third of California. G. K. Merrill is said to have collected 500 species of lichens within 20 miles of Rockland, and to have claimed that Maine had 700 kinds of lichens. However, he never published any general account of the Maine flora, but only new species or fragmentary accounts of species and genera, or lists.

The richness of the California flora, both in flowering plants and cryptogams, with its large number of peculiar or endemic species, is the result of many factors. Some of them are the great length of California, which extends through nine and a half degrees of latitude, and its consequent vast extent of varied coast line of over 1000 miles; its exceedingly diversified topography, more varied than that of any other state, which ranges from below sea level to the highest elevation in the states; excessive annual variation in rainfall, reaching 122 inches in places along the north-west coast, and dropping to half an inch, or even to zero some years, in certain areas in the south-eastern deserts; the summer fog belt along the coast of central and northern California; the temperature variations, ranging from frostless belts or areas to the boreal conditions of the high mountains. Extraordinary differences in elevation and contour occur within a few miles in many places, with astonishing variations in temperature and rainfall. One may go in ten miles from desert conditions to heavily forested regions of mild temperature and ample water and on to arctic peaks. No wonder the flora is varied.

Boosters have spread abroad the illusion that California has a subtropical climate. As a matter of fact California has a great diversity of climates, but the typical climate of most of the lowland areas is a cool temperate one, with but slight variation in the mean temperature throughout the year. When average temperatures range from 60 degrees for the warmest month to 52 degrees for the coldest month, lichens of alpine regions and from regions far southward can both find favorable living conditions. Add to the factors given above the geographical isolation of California, separated from the more humid east for hundreds of leagues by an elevated desert or semi-desert plateau and chains of the loftiest mountains in the country, we have some of the reasons why California not only has a rich flora but also abounds in endemic species of flowering plants, lichens, hepatics, and mosses.

At the same time, certain species abundant almost everywhere are conspicuous by their absence. No species of the genus *Graphis* has been discovered in California, although Fink states that *Graphis elegans* occurs "throughout the United States." As in the case of a number of like statements about other species, such a claim is too general. One of the most widespread lichens in North America is *Cladonia rangiferina*, with its near relatives, *C. sylvatica* and *C. alpestris*, yet the only representative of this group thus far known from California is a small specimen from Mendocino County of *Cladonia mitis*, which is really hardly more than a variety of *C. sylvatica*. Careful search in likely localities has not revealed *C. rangiferina*, and there can be no question that it is absent from the greater part, if not all, of California. One can hardly explain these and other peculiar absences, although the long dry summer, with its lack of rain and its low humidity, is perhaps the cause of some of them.

On the other hand, lichens that elsewhere are found in northern localities, or at high altitudes, or only in the higher mountains in southern parts of the eastern states, may occur in California at low altitudes, often alongside lichens from warmer regions. *Toninia caeruleo-nigricans* is found in southern California at an altitude of less than 600 feet, beside lichens typical of the warmer parts of the earth. *Rhizocarpon geographicum* occurs with us not more than 100 feet above sea level, along the coast where frost is practically unknown. In juxtaposition to these may be cited the following as examples of tropical elements in the California lichen flora: *Arthonia polygramma*, *Parmelia cirrhata*, *Ramalina ceruchis*, *Ramalina flaccescens*, *Ramalina yemensis*, and several species of *Roccella*.

However, typically tropical families, such as enter Florida from the West Indies, are altogether absent from California. There are no representatives of the following families in the state: Astrotheliaceae; Ectolechiaceae; Pyrenotrichiaceae; Strigulaceae; Thelephoraceae; and Trypetheliaceae. These families are all characteristic of the humid tropics, where the climate is altogether unlike that of California. They do occur though, in the southern tip of Florida, where the climate approximates that of the humid tropics. All the other families given in Fink's Manual are found in California, except the Pyrenothamniaceae, which has one genus occurring in Washington, the other in New Zealand. It is not likely to occur in California, though there is a possibility that it may be found when the high mountains of the north and northwestern parts of the state are fully explored.

If the general ecological distribution of lichens is considered, the state naturally divides into a few well marked areas, although each of these splits up into many small areas, each with its own peculiarities. The region in which the greatest number of strongly differentiated endemic species occurs is the maritime belt, which forms a narrow fringe along the coast line, nowhere more than a very few miles wide. This area is notable for its mild equable climate, many places seldom or never having frost, and for its relatively high humidity. It is characterized by its relatively cold, windy, and foggy summers, the fog partly compensating for the rainless months; the winters are comparatively clear and sunshiny, with less precipitation than in the hills behind. In a large way this area may be considered a part of the belt extending southward to the coast of Mexico and Central America and recurring again on the coast of Peru and southward to beyond Valparaiso, Chile. *Ramalina ceruchis*, *Ramalina flaccescens*, and other rock dwelling lichens occur in California, Mexico, Peru, and Chile, just as the Chilean strawberry and other plants range north to the coast of California.

Certain portions of the maritime belt are especially noteworthy for their high number of endemics. These are a strip of coast near San Diego, the Monterey Peninsula, the Santa Cruz Peninsula, the peninsula of Marin County, and the islands off the coast of southern California. Some of the more conspicuous endemics are *Anaptychia erinacea*, *Caloplaca coralloides*, *Chiodecton ochroleucum*, *Dendrographa leucophaea* and *D. minor*, *Lecanactis salicina* and *L. Zahlbruckneri*, *Lecanora Bolanderi*, *Lecanora phryganitis*, *Lecanora pinguis*, *Ramalina combeoides*, *R. crinita*, *R. ceruchis*, and *R. homalea*, *Rinodina radiata*, *Schismatomma californica*, *S. hypothallinum*, and *S. pluriloculare*, and *Schizopelte californica*. Curiously enough this region also has lichens elsewhere known only from considerable altitudes. In addition to examples already given, in Marin county *Massalongia carnosa* occurs. The only locality listed by Fink is the Yosemite, but I have also found it on rocks projecting above the glaciers on Mt. Baker, Washington, at 7000 feet.

The Coast Ranges form a broad belt which may be roughly divided into the Inner and Outer Ranges. To the north of them lie the Klamath Mountains, with which they fuse to form a complex that is almost unknown botanically. Only the central and southern portions of the coast ranges have had their lichens studied, and even there studies are only partially complete. The outer coast range of central

and northern California lies for the greater part in the coastal fog belt, its typical plant being the redwood, *Sequoia sempervirens*. Lichens are remarkably responsive to the influence of these summer fogs, which stream over the low mountains in definite channels. By glancing at the tree lichens, either in orchards or natural forests, one can tell exactly where the fog channels lie.

Few species are limited to this region, but a number reach here their maximum development. In the valleys and foothills of the outer range, with their park-like vistas of oaks, the lace lichen, *Ramalina reticulata*, sways in long pendulous streamers, or may swathe trees in its gray-green masses. *Parmelia soredica* is also conspicuous, especially on oaks, while on vertical sandstone outcrops *Parmelia Herreana* and *Parmelia perforata* grow in large circular mats, which may unite to form extensive carpets. *Parmelia conspersa* is abundant on rocks in sunny places, along with *Parmelia olivacea* and its close relatives. Other conspicuous species are *Leptogium palmatum, Ramalina leptocarpha, Ramalina farinacea, Evernia prunastri, Lecanora pallida, Lecanora subfusca* and *Lecanora varia, Physcia pulverulenta, Xanthoria parietina*, and such Cladonias as *C. chlorophaea, C. fimbriata, C. pyxidata*, and *C. verticillata*.

In the higher elevations, particularly in the redwood formation, many lichens reach their highest development, but there are few endemics. *Cetraria glauca*, and *C. stenophylla, Parmelia enteromorpha* and *P. quercina, P. perforata, P. caperata*, and *P. cetrarioides, Lobaria pulmonaria* and *Sticta anthraspis*, literally cover trees while on their bases and on the forest floor *Cladonia gracilis, Cladonia furcata*, and *Cladonia macilenta* spread extensively. *Alectoria jubata* and several Usneas, *dasypoga, dasypoga* var. *plicata, ceratina*, and *longissima*, form entangled masses on trees and shrubs. Prominent bark lichens are *Rinodina Halli, Lecidea elaeochroma, Ochrolechia parella, Ochrolechia tartarea* while *Bacidia Herrei* is endemic. On rocks *Leptogium californicum* and *L. platynum* are common endemics.

The inner coast range is much drier and its plants are in general much more xerophytic, while its foliose and fruticose lichens usually lack the luxuriant growth displayed in the outer range. Characteristic lichens are *Alectoria oregana, Alectoria Fremonti*, and *Nephromopsis californica*, on trees. Common rock-dwelling species are *Acarospora flava, Lecanora rupicola, Parmelia lineola* and *P. conspersa, Rinodina oreina, Gyrophora angulata* and *Gyrophora phaea*. The last named is found all over California, from near sea level to 6000 feet or more, but reaches its maximum size in the inner coast range.

It is from the Klamath mountains, with peaks 6000 to 8000 feet high, that large additions to the lichens of California may be expected, especially in the more humid northwest.

Perhaps the area most alien to botanists east of the Rockies is the Lower Sonoran, typified by the Colorado and Mojave deserts. The Colorado desert varies from more than 240 feet below sea level to about 500 feet altitude, and passes gradually into the Mohave desert, with altitudes from about 2000 to 5000 feet. North from the Mojave desert extends Death Valley, which at its lowest point is 276 feet below sea level. Both Death Valley and the Mojave desert belong to the Interior Basin. The desert areas have an annual rainfall from about 10 inches down to zero, with very high summer temperatures. The heat of Death Valley is most extreme, 134 degrees in the shade having been recorded.

The Great Valley, or Sacramento-San Joaquin Valley, 450 miles long by about 40 broad, also belongs to the Lower Sonoran, and large areas are semi-desert. It has excessive summer temperatures and a scanty rainfall, while its entire drainage converges to a single outlet into San Francisco Bay. It was originally treeless for the most part. Irrigation has made it a highly productive area of orchards, alfalfa, rice, and dairy ranches, while hay, grain, and beef cattle ranches are in the drier parts.

The characteristic lichens of the desert areas are xerophytic earth-dwelling crustaceous species, usually of thick squamules. Often they form patches of considerable extent, their rhizoids binding together the loose granules of the desert surface. Numerous endemic species of *Acarospora, Heppia,* and a few members of the family Pyrenopsidaceae, along with *Lecideas* of the section Psora, and several species of *Endocarpon,* are the most characteristic lichens. *Anema Dodgei* Herre, recently described from southern California, is not only noteworthy as representing a genus not hitherto known from North America, but is remarkable because its rhizoids are extensions of the algal component of the lichen, and not hyphae of the fungus, as is usually the case. Rock lichens of the genera *Lecidea, Rinodina, Parmelia,* and *Caloplaca* are also abundant in the desert. In semi-desert uncultivated parts of the Great Valley almost the only lichens occurring over extensive areas may be a very few species on old fences and posts, such as *Lecanora symmicta* and its variety *saepincola, Lecanora varia, Buellia disciformis, Candelariella vitellina,* and *Xanthoria parietina.*

The high Sierras and Cascades form another well-marked area. Here occur vast forests of many remarkable kinds of Coniferae, on which flourish a lichen flora that even attracts the attention of the casual tourist. *Letharia vulpina* attains a remarkable luxuriance, and densely clothes the pines and other conifers. Other characteristic species are *Parmelia sphaerosporella,* and *Parmelia enteromorpha, Buellia oidalea* and *Buellia penichra, Calicium hyperellum,* and such *Alectorias* as *A. jubata, A. sarmentosa,* and *A. chalybeiformis.*

Above the forests rise the lofty peaks, snow capped most of the year, many of them from 9500 to 14,496 feet in height. Here conditions are truly boreal, and the rocks are decorated by such brilliant species as *Caloplaca elegans,* and *Rhizocarpon geographicum.* Characteristic species are *Acarospora thamnina, Gyrophora decussata, Gyrophora erosa, Gyrophora rugifera, Gyrophora arctica, Gyrophora hyperborea, Lecanora rubina, Lecanora peltata, Lecanora semitensis, Lecanora thamnoplaca, Lecidea atrobrunnea, Parmelia lanata,* and *Rinodina thysanota.*

On its eastern front area this descends with great abruptness to the level of the Interior Basin, about 4500 to 5500 feet. Here desert conditions exist. In addition to the areas already mentioned as belonging to it, the north-eastern corner of California, as well as portions of the eastern rim are also part of it. Lichens have been but little studied or collected, and are largely rock dwellers. The number of species is small, characteristic ones being *Acarospora citrina, Acarospora flava, Acarospora thermophila, Endocarpon tortuosum, Lecanora rubina, Lecanora muralis, Lecanora thamnoplaca, Lecidea truckeei, Caloplaca elegans, Caloplaca murorum,* and *Gyrophora phaea,* which is here reduced to the status of a crustose lichen. Nine-tenths of the lichens found in this area belong to the genera *Acarospora, Caloplaca, Gyrophora, Lecanora, Lecidea,* and *Rinodina.*

The genus *Lecidea* is represented in California by 84 species, other genera of the family containing 55 species. *Lecanora* has 48 species and varieties, while *Cladonia* and *Parmelia* are each represented by 36. The families Dirinaceae, with one genus, *Dirina,* and four species, Roccellaceae, with three genera and nine species, and Pyrenidiaceae, with one genus and one species, do not occur in the rest of the United States, but only in California, and there only in the maritime belt.

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UTAH HEPATICS

SEVILLE FLOWERS

To the present time the collection of hepatics in Utah has not been extensive. With the exception of the high mountains the climate of Utah is dry and these plants at first appear to be relatively scarce, but the limited collecting done thus far has yielded a fairly wide variety indicating that they may prove to be rich in species while poor in abundance of individuals. In the field no particular attempt was made to select the material collected and about seventy-five specimens yielded thirty-seven species. The majority of these plants grow in the mountains in damp places or around water but a few occur in desert regions watered only by intermittent streams. With a few exceptions most of the specimens were identified by Dr. Lois Clark to whom I am very grateful.

RICCIACEAE

RICCIA CRYSTALLINA L. No. 8034. On damp soil and wet banks, 7,000 feet; Mt. Timpanogos, Utah Co.

RICCIA GLAUCA L. No. 8011. On exposed muddy surfaces around lakes and in subalpine meadows, 9,000 feet; Lily Lake, Uintah Mountains, Summit Co. Apparently quite common in the high mountains.

RICCIA FLUITANS L. No. 8038. In ponds and slow streams, 4,500 feet; Fish hatchery, Springville; No. 8048. Salem pond, Salem, Utah Co. Uncommon.

RICCIA FROSTII Aust. No. 8033. On damp or wet soil around springs, 7,500 feet; Mt. Timpanogos, Utah Co.

RICCIOCARPUS NATANS (L.) Corda, No. 8039. Floating on ponds and in swamps, 4,500 feet; Near Logan, Cache Co., No. 8043. Floating among cattails in swamp bordering Utah Lake, 4,500 feet; Utah Co.

MARCHANTIACEAE

TARGIONIA HYPOPHYLLA L. No. 8022. On dry sandy soil at base of rocks and cliffs, desert regions, 3,400 feet; Berry Spring, Washington Co., No. 8023. On dry soil under sandstone cliffs, 3,500 feet; Near Hurricane, Washington Co. Common in the southern part of the state where it has been observed in many localities in San Juan, Kane and Washington Counties.

CLEVEA HYALINA (Somm.) Lindb. No. 8017. On damp soil in mountains, 6,000 feet; Stairs Fork, Big Cottonwood Canyon, Salt Lake Co. Frequent in high mountains, especially among grasses on damp banks and in meadows.

ASTERELLA LINDENBERGIANA (Corda) Lindb. No. 8016. On wet rocks and soil, 10,000 feet; Glacial cirque, Mt. Timpanogos, Utah Co.

ASTERELLA LUDWIGII (Schwaegr.) Underw. No. 8040. In crevices of wet rocks, 9,000 feet; Mt. Timpanogos, Utah Co. Occasional in the high mountains.

CONOCEPHALUM CONICUM (L.) Dum. No. 8041. On wet soil and humus, bank of brook in deep shade, 7,600 feet; Mill D Fork, Big Cottonwood Canyon, Salt Lake Co. Common.

LUNULARIA CRUCIATA (L.) Dum. No. 8042. On damp soil, 4,400 feet; Greenhouse, Salt Lake City, Salt Lake Co. It has been observed on three occasions in different greenhouses.

PREISSIA QUADRATA (Scop.) Nees. No. 8032. Wet soil in shade, under shrubs bordering brook, 8,600 feet; Alta, Salt Lake Co. Apparently not common.

MARCHANTIA POLYMORPHA L. No. 8029. Submerged in slow brooklet, 7,000 feet; Big Cottonwood Canyon, Salt Lake Co. This species is our commonest liverwort and probably occurs in every county of the state. It usually grows on wet or damp soil, humus, rocks or rotten wood.

METZGERIACEAE

RICCARDIA PINGUIS (L.) S. F. Gray. No. 8005. Submerged in cold spring, shady woods, 5,500 feet; Trout Creek, Deep Creek Mountains, Juab Co. No. 8028. Submerged in slow streamlet, 7,000 feet; North Fork, City Creek Canyon, Salt Lake Co. Frequent in shady places in the mountains on wet banks and in slow streams.

PELLIA sp. Nos. 2005 and 2032. Wet brook banks in shade, 10,500 feet; Bald Mountain, Uintah Mountains, Summit Co. Frequent in the high mountains throughout the state where it has been observed many times but always in the sterile condition.

JUNGERMANNIACEAE

JUNGERMANNIA CORDIFOLIA Hook. No. 8019. On damp soil and quartzite in shade, 7,000 feet; Big Cottonwood Canyon, Salt Lake Co., No. 8024. On granite stones in brook, shady wood, 6,700 feet; Tanner's Flat, Little Cottonwood Canyon, Salt Lake Co.

JUNGERMANNIA LANCEOLATA Schrad. No. 2017. On wet brook banks in shade, 10,000 feet; Bald Mountain, Uintah Mountains, Summit Co.

JUNGERMANNIA SPHAEROCARPA Hook. No. 2017. Wet brook banks in shade; 10,300 feet; Bald Mountain, Uintah Mountains, Summit Co.

LOPHOZIA ALPESTRIS (Schleich.) Evans. No. 2119. Boggy lake shore; 10,200 feet, Bald Mountain, Uintah Mountains, Summit Co.

LOPHOZIA LYCOPODIOIDES (Wall.) Cogn. Nos. 2083 and 2136. On wet banks of ponds and brooks, 10,300 feet; Bald Mountain, Uintah Mountains, Summit Co.

LOPHOZIA HETEROCOLPA (Thed.) Howe. No. 8031. On damp shaded banks; 9,000 feet; Columbine Falls, Mt. Timpanogos, Utah Co.

LOPHOZIA PORPHYROLEUCA (Nees) Schiffner. No. 2119-A. Boggy lake shore, 10,300 feet; Mirror Lake, Uintah Mountains, Summit Co.

LOPHOZIA VENTRICOSA (Dicks.) Dum. Nos. 8012 and 8013. On wet rotten logs in shaded boggy area, 11,000 feet; Wolf Creek Summit, Wasatch Co.

LOPHOCOLEA HETEROPHYLLA (Schrd.) Dum. No. 8015. On damp humus, 10,000 feet; Near Mirror Lake, Uintah Mountains, Summit Co.

CHILOSCYPHUS FRAGILIS (Roth.) Schiffner. No. 8010. In cool brook under overhanging cliffs; 4,800 feet; Kanab Canyon, Kane Co. Apparently quite common in slow brooks both in lowlands and in the mountains.

CHILOSCYPHUS PALLESCENS (Ehrh.) Dum. No. 655. On rotten log in cold spring, 6,100 feet; Stewart's Fork, Mt. Timpanogos, Utah Co. No. 8000 On stones splashed by brook, 7,500 feet; Big Cottonwood Canyon, Salt Lake Co., No. 8003. Wet banks in deep shade, 10,300 feet; Mirror Lake, Uintah Mountains, Summit Co. No. 8006. Damp humus, banks of brooklet in shade, 6,000 feet; Lamb's Canyon, Salt Lake Co. This species has been observed in several other counties of the state and is quite common.

CHILOSCYPHUS POLYANTHUS (L.) Corda, No. 8014. On wet soil and humus, banks of brooks and lake side, 8,600 feet; Brighton, Wasatch Mountains, Salt Lake Co., No. 2124. On rocks, submerged in brook, 10,000 feet; Bald Mountain, Uintah Mountains, Summit Co. This species is very common in streams, lakes and boggy areas in the Uintah Mountains.

CEPHALOZIA BICUSPIDATA (L.) Corda, No. 2075. Wet soil on shaded brook banks, 10,000 feet; Bald Mountain, Uintah Mountains, Summit Co.

CALYPOGEIA TRICHOMANIS (L.) Corda, No. 2075-A. Wet soil on shaded brook banks, 10,000 feet; Bald Mountain, Uintah Mountains, Summit Co.

SCAPANIA CURTA (Mart.) Dum. Nos. 2075 and 8030. On wet brook banks in shade, Bald Mountain, 10,000 feet, and Mirror Lake, 10,300 feet, Uintah Mountains, Summit Co.

SCAPANIA OAKESII Aust. No. 2017-A. Wet brook banks in shade, 10,000 feet; Bald Mountain, Uintah Mountains, Summit Co.

SCAPANIA SUBALPINA (Nees) Dum. No. 8001. On moist humus, partial shade, 10,200 feet, Near Mirror Lake, Uintah Mountains, Summit Co.

SCAPANIA UNDULATA (L.) Dum. Nos. 8007 and 8009. On wet banks and lake shores, Mirror Lake, Uintah Mountains, Summit Co.

RADULA COMPLANATA (L.) Dum. No. 8021. On damp sandstone, mouth of cave, 4,000 feet; Kanab Canyon, Kane Co.

PORELLA BOLANDERI (Aust.) Pears. No. 1607. On damp soil and granite rocks, 7,000 feet; Little Cottonwood Canyon, Salt Lake Co. Nos. 7196 and 7198. On overhanging limestone cliffs, 7,000 feet; City Creek Canyon, Salt Lake Co. No. 8018. On damp soil in shade, 7,000 feet; Stairs Fork, Big Cottonwood Canyon, Salt Lake Co. This common species has been observed in many localities in the Wasatch Mountains.

FRULLANIA INFLATA Gottsche. No. 8026. Dry sandy soil, damp only during spring, base of cliffs, 4,000 feet; Kanab Canyon, Kane Co.

FRULLANIA SAXICOLA Aust. On dry sandstone, base of cliffs, 4,000 feet; Kanab Canyon, Kane Co.

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THE BRYOPHYTES OF THE APPALACHIAN PLATEAU IN NORTHERN GEORGIA

GLADYS CARROLL

I. INTRODUCTION

This study includes bryophytes from the northwestern part of the state of Georgia which lies within the Appalachian Plateau Province. The area extends from the Alabama and Tennessee state lines south and east to the boundary of the Ridge and Valley Province. So far as is known to the writer, there have been no specific published records from this area, although there are many published records from other parts of the state. Both Leo Lesquereux and William S. Sullivant collected in northern Georgia but their records are from the Blue Ridge Section to the east.

II. DESCRIPTION OF THE AREA

The Appalachian Plateau Province in Georgia occupies the northwest corner of the state (see Map), in Dade, Walker and Chattooga Counties (Fenneman, 1938). It is made up of a number of ridges or mountains and valleys which, for the most part, run in a northeast-southwest direction. Sand Mountain, a continuation of the Cumberland Plateau known as Walden Ridge in Tennessee, extends across the extreme northwest corner of Dade County. East of Sand Mountain is a broad valley, known as the Lookout Valley in its northern part and as the Wills Valley southward. Lookout Mountain, rising

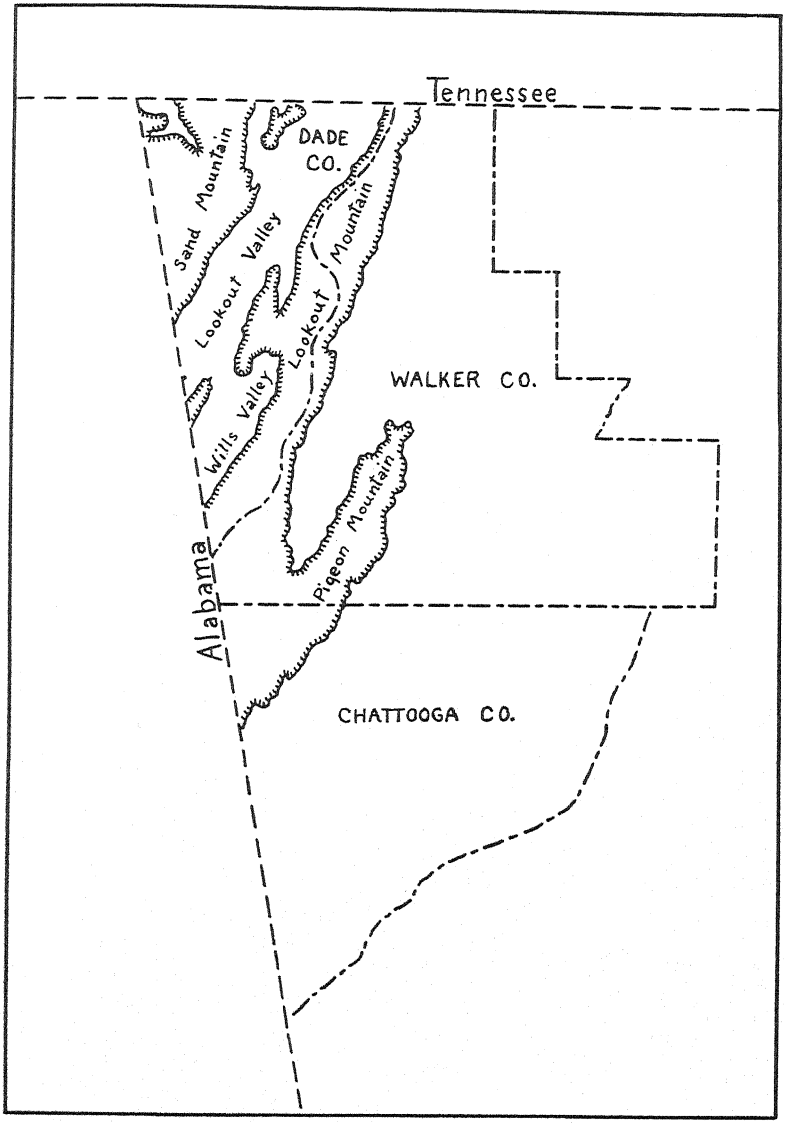
to the east of the valley, is an outlying part of the Plateau, and extends in a southwestward direction from an abrupt escarpment at Chattanooga, Tennessee, through all three of the counties, and into Alabama. The eastern escarpment of Lookout Mountain is the boundary of the Province.

As is to be expected, the topography of the region is varied. The tops of the mountains are generally level. Lookout Mountain rises to a height of about 2300 feet, approximately 1100 feet above the valley floor, and Sand Mountain is somewhat lower (700 to 800 feet). They are capped by thick strata of sandstones of the Pottsville age, known as the Walden and Lookout Formations. These rocks form great cliffs at the edges of the plateaus. In several places, streams have cut gorges which extend into the sandstones. The soil of the plateaus is generally sandy and acidic, a condition which is reflected by the vegetation. Low swampy areas also occur on the flat uplands where the ground water is near the surface. The Bangor limestone forms the lower slopes of both Lookout and Sand Mountains. Several narrow chert ridges of varying heights are parallel to these.

The broad valley between the two mountains is cut into the limestone-chert formation and the shales. The soils derived from this parent material are calcareous, and the vegetation differs from that of the plateaus. Many small tributaries of the main valley stream, Lookout Creek, have cut down through shales and limestones to form cliffs which afford excellent habitats for bryophytes.

The area is located in the mixed mesophytic forest association of the Central Deciduous Forest. Deciduous trees such as tulip, sugar maple, ash, buckeye, beech and hickory are prominent in the valley. Locally, red cedar may predominate on rocky, calcareous hillsides. The dry ridge tops and the tops of the mountains are covered in a large part by an oak-pine forest. The acidic soil derived from the sandstone is especially favorable for the development of ericaceous plants, and dense tangles of rhododendron and mountain laurel are common along the mountain streams. Large hemlock, magnolia, and holly trees are also abundant there.

The annual precipitation averages about 51 inches and is well distributed throughout the year. The climate in general is essentially that of the south-central part of the United States, characterized by long summers and short, mild winters.



MAP OF THE NORTHWEST CORNER OF GEORGIA SHOWING THE EXTENT OF THE APPALACHIAN PLATEAU.

III. NOTES ON OCCURRENCE

The bryophytes tend to reflect the diversity of the types of habitat of the region as do the higher plants. The dry sandstone cliffs are occupied mostly by *Hedwigia ciliata*, and species of *Grimmia*. Characteristic of the acid swampy areas are species of *Dicranum* and *Polytrichum*, which often surround mats of *Aulacomnium palustre* and *Sphagnum* in the wetter areas. Typical of the species found submerged and attached to sandstones in the cool mountain streams are *Rhacomitrium aciculare*, *Eurhynchium riparioides*, *Leptodictyum riparium*, and species of *Fontinalis*. *Mnium hornum*, *Pallavicinia Lyellii*, and *Diplophyllum apiculatum* are abundant along the streams in the dense thickets of hemlock, holly, rhododendron and mountain laurel.

Other species characterize the limestone areas of the valley. Wet rocks in streams are usually occupied by species of *Bryum*, *Philonotis*, and *Hygroamblystegium*. *Climacium americanum*, *Bartramia pomiformis*, and *Aulacomnium heterostichum* are typical of the moist shaded cliffs of the valley.

Certain of the corticolous species, such as *Anomodon attenuatus*, *Leucodon julaceus*, *Leptodon trichomitrion*, and species of *Orthotrichum*, grow mostly on deciduous trees. Others, including *Frullania squarrosa* and *Thelia hirtella*, grow more abundantly on red cedar.

The favorable location of the area, the wide variety of habitats, and also the past geological history of the region, are all contributing factors in the present plant distribution. There are several endemics among the vascular plants (Mohr, 1901), although none among the bryophytes has come to light. According to Sharp (1939), several of the species here have southern or sub-tropical affinities. Among these are *Fissidens polypodioides*, *Sematophyllum adnatum*, *Thuidium virginianum*, *Plagiochila undata*, *P. ludoviciana*, and *Leucolejeunea unciloba*.

The widespread species, such as *Bryum argenteum*, *Physcomitrium turbinatum*, and *Funaria hygrometrica* are found universally in waste areas.

IV. LIST OF BRYOPHYTES

The following list is based upon the writer's collections begun in the summer of 1940. Notes given for each species include habitats, frequency of occurrence, and localities. The counties in which the various collections were made are indicated, as well as the location in regard to mountains or valleys. A complete set of the specimens is in

the Herbarium of the University of Cincinnati and a duplicate set is in the writer's collection.

The classification and nomenclature of the Hepaticae are according to the "List of Hepaticae found in the United States, Canada, and Arctic America" (Evans, 1940). The mosses are arranged according to the "Moss Flora of North America north of Mexico" (Grout, 1928–1940).

The writer wishes to express appreciation to Dr. Margaret Fulford for her suggestions and extensive assistance during the progress of this study, and to Dr. A. J. Grout, Dr. A. L. Andrews, Dr. Seville Flowers, and Dr. Winona H. Welch for the determination of specimens.

HEPATICAE

PTILIDIACEAE

TRICHOCOLEA TOMENTELLA (Ehrh.) Dumort. Moist earth beside stream, among mosses. Cave Springs, Wills Valley, Dade County. Rare.

LEPIDOZIACEAE

BAZZANIA TRILOBATA (L.) S. F. Gray. On moist soil by stream. Lookout Mountain, Dade County. Common.

MICROLEPIDOZIA SYLVATICA (Evans) Joerg. On soil. Lookout Valley, Dade County. Common.

CALYPOGEIACEAE

CALYPOGEIA FISSA (L.) Raddi. On moist sandy soil. Daniel Creek, Lookout Mountain, Dade County. Common.

CALYPOGEIA NEESIANA (Massal. & Carest.) K. Müll. Byrd's Chapel, Dade County. Common.

CALYPOGEIA TRICHOMANIS (L.) Corda. On sandy soil. Lookout Mountain, Dade County. Common.

CEPHALOZIACEAE

CEPHALOZIA BICUSPIDATA (L.) Dumort. On soil. Byrd's Chapel, Lookout Valley, Dade County. Common.

CEPHALOZIA CATENULATA (Hüben.) Spruce. On decayed logs. Daniel Creek, Lookout Mountain, Dade County; Lookout Mountain, Walker County. Common.

CEPHALOZIA MEDIA Lindb. On sandy soil. Daniel Creek, Lookout Mountain, Dade County. Common.

NOWELLIA CURVIFOLIA (Dicks.) Mitt. On decaying logs. Lookout Mountain, Dade County. Occasional.

ODONTOSCHISMA DENUDATUM (Mart.) Dumort. On decaying logs. Lookout Mountain, Dade County. Occasional.

ODONTOSCHISMA PROSTRATUM (Sw.) Trevis. On soil. Lookout Mountain, Dade County. Common.

HARPANTHACEAE

LOPHOCOLEA BIDENTATA (L.) Dumort. On soil in deep woods. Byrd's Chapel, Lookout Valley, Dade County. Occasional.

LOPHOCOLEA HETEROPHYLLA (Schrad.) Dumort. On moist soil. Wildwood, Lookout Valley, Dade County. Occasional.

JUNGERMANNIACEAE

JUNGERMANNIA LANCEOLATA L. Among mosses on soil. Byrd's Chapel, Lookout Valley, Dade County. Common.

PLAGIOCHILACEAE

PLAGIOCHILA ASPLENIOIDES (L.) Dumort. On soil. Crawfish Creek, Lookout Valley, Dade County. Common.

PLAGIOCHILA LUDOVICIANA Sull. On moist rocks. Cave Springs, Wills Valley, Dade County. Occasional.

PLAGIOCHILA UNDATA Sull. On moist soil. Hooker, Lookout Valley, Dade County. Occasional.

SCAPANIACEAE

DIPLOPHYLLUM APICULATUM (Evans) Steph. On soil. Lookout Mountain, Chattooga County; Daniel Creek, Lookout Mountain, Dade County. Abundant.

SCAPANIA NEMOROSA (L.) Dumort. On moist sandy soil and sandstone rocks. Sand Mountain, Lookout Mountain, Dade County. Common.

SCAPANIA UNDULATA (L.) Dumort. On soil. Byrd's Chapel, Lookout Valley, Dade County. Common.

PORELLACEAE

PORELLA PINNATA L. On submerged rocks and roots of trees. Cole City Hollow, Sand Mountain, Dade County. Abundant.

PORELLA PLATYPHYLLOIDEA (Schwein.) Lindb. On bark of trees. Byrd's Chapel, Lookout Valley, Dade County; Lookout Mountain, Chattooga County. Abundant.

RADULACEAE

RADULA ANDICOLA Steph. Among mosses on moist cliffs. Hooker, Lookout Valley, Dade County. Occasional.

RADULA COMPLANATA (L.) Dumort. On logs. Bear Creek, Lookout Mountain, Dade County. Abundant.

RADULA OBCONICA Sull. On moist soil. Wildwood, Lookout Valley, Dade County. Common.

FRULLANIACEAE

FRULLANIA ASAGRAYANA Mont. On bark of trees. Wildwood, Byrd's Chapel, Lookout Valley, Dade County. Abundant.

FRULLANIA EBORACENSIS Gottsche. On bark of trees. Byrd's Chapel, Lookout Valley, Dade County. Common.

FRULLANIA INFLATA Gottsche. On bases of trees. Byrd's Chapel, Lookout Valley, Dade County, Common.

FRULLANIA SQUARROSA (R. Bl. & N.) Dumort. On bark of trees and on stumps. Lookout Mountain, Chattooga County; Byrd's Chapel, Lookout Valley, Dade County. Abundant.

JUBULA PENNSYLVANICA (Steph.) Evans. On moist sandstone rocks. Daniel Creek, Lookout Mountain, Dade County. Common.

LEJEUNEACEAE

LEUCOLEJEUNEA CLYPEATA (Schwein.) Evans. On bark of trees. Daniel Creek, Lookout Mountain, Byrd's Chapel, Lookout Valley, Dade County. Abundant.

LEUCOLEJEUNEA UNCILOBA (Lindenb.) Evans. On bark of trees. Daniel Creek, Lookout Mountain, Dade County. Occasional.

MICROLEJEUNEA LAETEVIRENS (Nees & Mont.) Evans. On trees. Cave Springs, Wills Valley, Dade County. Common.

MICROLEJEUNEA ULICINA (Tayl.) Evans. On trees. Byrd's Chapel, Lookout Valley, Dade County. Common.

PELLIACEAE

PELLIA NEESIANA (Gottsche) Limpr. Moist soil, bank of stream. Bear Creek, Lookout Mountain, Dade County. Common.

PALLAVICINIACEAE

PALLAVICINIA LYELLII (Hook.) S. F. Gray. On moist sandy soil along creeks. Daniel Creek, Lookout Mountain, Dade County. Abundant.

METZGERIACEAE

METZGERIA FURCATA (L.) Dumort. On moist soil. Daniel Creek, Lookout Mountain, Dade County. Abundant.

RICCARDIACEAE

RICCARDIA LATIFRONS Lindb. On moist soil. Lookout Mountain, Chattooga County; Byrd's Chapel, Lookout Valley, Dade County. Common.

RICCARDIA MULTIFIDA (L.) S. F. Gray. On moist soil. Byrd's Chapel, Lookout Valley, Dade County. Abundant.

RICCARDIA PINGUIS (L.) S. F. Gray. On moist banks of streams. Bear Creek, Lookout Mountain, Dade County. Common.

MARCHANTIACEAE

CONOCEPHALUM CONICUM (L.) Dumort. On moist soil. Lookout Mountain, Chattooga County; Crawfish Creek, Lookout Valley, Dade County; Pigeon Mountain, Walker County. Abundant.

DUMORTIERA HIRSUTA (Sw.) Nees. Wet sandstone rocks under waterfall. Cole City Hollow, Sand Mountain, Dade County. Wet rocks. Cave Springs, Wills Valley, Dade County. Occasional.

REBOULIACEAE

REBOULIA HEMISPHAERICA (L.) Raddi. Moist soil on bank of stream. Chattooga River, Chattooga County; Byrd's Chapel, Lookout Valley, Dade County. Common.

ANTHOCEROTACEAE

ANTHOCEROS CAROLINIANUS Mx. Moist soil by pond. Sulphur Springs, Lookout Valley, Dade County. Occasional.

ANTHOCEROS LAEVIS L. On moist soil below cliffs. Hooker, Byrd's Chapel, Lookout Valley, Lookout Mountain, Dade County. Common.

MUSCI

SPHAGNACEAE*

SPHAGNUM IMBRICATUM Hornsch. On moist sandy soil. New Salem, Lookout Mountain, Sand Mountain, Dade County; Pigeon Mountain, Walker County. Abundant.

SPHAGNUM IMBRICATUM var. AFFINE (Ren. & Card.) Warnst. On moist sandy soil. Lookout Mountain, Dade County. Frequent.

SPHAGNUM SUBSECUNDUM Nees. On moist sandy soil in swamp. Lookout Mountain, Dade County. Abundant.

POLYTRICHACEAE

ATRICHUM ANGUSTATUM (Brid.) Bry. Eur. On sandy soil. Hooker, Lookout Mountain, Dade County; Pigeon Mountain, Walker County. Common.

ATRICHUM ANGUSTATUM var. PLURILAMELLATUM (Jennings) Frye. On dry, gravelly soil. Wildwood, Lookout Valley, Dade County; Near Durham, Lookout Mountain, Walker County. Occasional.

†ATRICHUM MACMILLANI (Holz.) Frye. On soil at base of stump. Near New Salem, Lookout Mountain, Dade County. Occasional.

ATRICHUM UNDULATUM (Hedw.) Beauv. On moist soil on bank of stream. Base of Lookout Mountain, Chattooga County; Byrd's Chapel, Lookout Valley, Dade County; near Durham, Lookout Mountain, Walker County. Common.

* Determined by Dr. A. L. Andrews.
† Determined by Dr. A. J. Grout.

POGONATUM PENNSYLVANICUM (Hedw.) Paris. On moist sandy soil of stream banks. New Salem, Lookout Mountain, Dade County; near Durham, Lookout Mountain, Walker County. Occasional.

POLYTRICHUM COMMUNE Hedw. On moist sandy soil and in swamps. Near New Salem, Lookout Mountain, Byrd's Chapel, Lookout Valley, Dade County; near Durham, Lookout Mountain, Walker County. Abundant.

POLYTRICHUM JUNIPERINUM Hedw. On sandy soil in pine woods. Lookout Mountain, Sand Mountain, Dade County. Common.

POLYTRICHUM OHIOENSE Ren. & Card. On moist sandy soil in woods. Bear Creek, Lookout Mountain, Hooker, Lookout Valley, Dade County. Common.

FISSIDENTACEAE

FISSIDENS CRISTATUS Wils. Moist soil along streams. Hooker, Lookout Valley, Bear Creek, Lookout Mountain, Dade County; Pigeon Mountain, Walker County. Common.

FISSIDENS OSMUNDIOIDES Hedw. Moist soil on stream banks. Daniel Creek, Lookout Mountain, Dade County. Occasional.

FISSIDENS POLYPODIOIDES Hedw. Moist soil on bank of stream. Daniel Creek, Lookout Mountain, Dade County. Common.

FISSIDENS TAXIFOLIUS Hedw. On moist soil on bank of streams. Byrd's Chapel, Lookout Valley, Dade County; Pigeon Mountain, Walker County. Common.

DITRICHACEAE

DITRICHUM PALLIDUM (Hedw.) Hampe. On dry soil in woods. Byrd's Chapel, Lookout Valley, Dade County; Pigeon Mountain, Walker County. Common.

DICRANACEAE

DICRANELLA HETEROMALLA (Hedw.) Schimp. On sandy soil. Swamp near New Salem, Lookout Mountain, Dade County. Occasional.

DICRANELLA RUFESCENS (Smith) Schimp. On decayed log in woods. Hooker, Lookout Valley, Dade County. Occasional.

DICRANODONTIUM DENUDATUM (Brid.) E. G. Britton. On dry rocky soil. At base of Lookout Mountain, Chattooga County. Occasional.

DICRANUM CONDENSATUM Hedw. On sandy soil and on sandstone. Lookout Mountain, Dade County. Occasional.

DICRANUM FLAGELLARE Hedw. On decaying logs. Cole City Hollow, Sand Mountain, Dade County. Occasional.

DICRANUM FUSCESCENS Turn. On dry sandy soil. Lookout Mountain, Sand Mountain, Dade County. Occasional.

DICRANUM SCOPARIUM Hedw. On soil. Base of Lookout Mountain, Chattooga County; Wildwood, Lookout Valley; Lookout Mountain, Sand Mountain, Dade County; Pigeon Mountain, Walker County. Abundant.

LEUCOBRYACEAE

LEOCOBRYUM GLAUCUM (Hedw.) Schimp. On decayed logs and soil. Base of Lookout Mountain, Chattooga County. Lookout Mountain, Dade County; Pigeon Mountain, Walker County. Abundant.

BUXBAUMIACEAE

DIPHYSCIUM FOLIOSUM (Hedw.) Mohr. On sandy soil bank in open woods. Byrd's Chapel, Lookout Valley, Dade County. Occasional.

POTTIACEAE

GYMNOSTOMUM CALCAREUM Nees & Hornsch. Soil on edge of limestone cliffs. Hooker, Lookout Valley, Dade County. Occasional.

TORTELLA HUMILIS (Hedw.) Jennings. Soil at base of stumps and trees in open woods. Byrd's Chapel, Lookout Valley, Dade County. Common.

WEISIA VIRIDULA Hedw. Soil in damp rich woods. Byrd's Chapel, Lookout Valley, Dade County; Pigeon Mountain, Walker County. Common.

GRIMMIACEAE

GRIMMIA LAEVIGATA (Brid.) Brid. On dry sandstone cliffs. Lookout Mountain, Sand Mountain, Dade County; Pigeon Mountain, Walker County. Common.

GRIMMIA PILIFERA Beauv. On dry sandstone rocks. Lookout Mountain, Dade County; near Durham, Lookout Mountain, Walker County. Common.

HEDWIGIA CILIATA Hedw. On dry sandstone rocks. Lookout Mountain, Sand Mountain, Dade County. Common.

RHACOMITRIUM ACICULARE Brid. On moist sandstone rocks in stream. Daniel Creek, Lookout Mountain, Dade County. Occasional.

FUNARIACEAE

FUNARIA FLAVICANS Mx. On dry soil in old fields. Byrd's Chapel, Lookout Valley, Dade County. Common.

FUNARIA HYGROMETRICA Hedw. On dry sandy soil. Lookout Mountain, Sand Mountain, Dade County. Abundant.

PHYSCOMITRIUM TURBINATUM (Mx.) Brid. On dry soil in old field. Byrd's Chapel, Lookout Valley, Dade County. Abundant.

ORTHOTRICHACEAE

DRUMMONDIA PROREPENS (Hedw.) Jennings. On bark of trees in open woods. Byrd's Chapel, Lookout Valley, Dade County. Common.

ORTHOTRICHUM PUMILUM Dicks. On bark of trees in open woods. Byrd's Chapel, Lookout Valley, Dade County. Occasional.

AULACOMNIACEAE

AULACOMNIUM HETEROSTICHUM (Hedw.) Bry. Eur. On dry soil banks. Base of Lookout Mountain, Chattooga County. Byrd's Chapel, Wildwood, Hooker, Lookout Valley, Dade County. Abundant.

AULACOMNIUM PALUSTRE (Web. & Mohr) Schwaegr. On soil at base of stump in swamp. Lookout Mountain, Dade County. Common.

BARTRAMIACEAE

BARTRAMIA POMIFORMIS Hedw. On soil banks. Lower slope of Lookout Mountain, Chattooga County; Cave Springs, Byrd's Chapel, Lookout Valley, Dade County. Common.

*PHILONOTIS SPHAERICARPA (Sw.) Brid. On moist soil on stream bank. Byrd's Chapel, Lookout Valley, Dade County. Occasional.

PHILONOTIS FONTANA (Hedw.) Brid. On wet rocks. Cave Springs, Wills Valley, Dade County. Occasional, common.

PHILONOTIS MARCHICA (Willd.) Brid. On wet soil of stream bank. Byrd's Chapel, Lookout Valley, Dade County. Occasional.

BRYACEAE

BRYUM ARGENTEUM Hedw. On dry soil in open areas. Byrd's Chapel, Lookout Valley; Lookout Mountain, Sand Mountain, Dade County. Abundant.

RHODOBRYUM ROSEUM (Bry. Eur.) Limpr. On moist soil in deep woods. Byrd's Chapel, Hooker, Lookout Valley, Dade County. Occasional.

MNIACEAE

MNIUM AFFINE Bland. On moist soil in deep woods. Base of Lookout Mountain, Chattooga County; Byrd's Chapel Lookout Valley, Dade County. Common.

MNIUM CUSPIDATUM Hedw. On moist soil in deep woods. Base of Lookout Mountain, Chattooga County; Byrd's Chapel, Hooker, Lookout Valley; Lookout Mountain, Dade County. Abundant.

MNIUM HORNUM Hedw. On moist sandy soil. Daniel Creek, Lookout Mountain, Dade County. Common.

MNIUM PUNCTATUM Hedw. On moist soil along stream. Daniel Creek, Lookout Mountain, Dade County. Occasional.

MNIUM PUNCTATUM var. ELATUM Schimp. On very moist soil bank of stream. Bear Creek, Lookout Mountain, Dade County. Occasional.

†MNIUM MARGINATUM (Dicks.). On wet rocks and soil. Cave Springs, Wills Valley, Dade County. Occasional.

HYPNACEAE

AMBLYSTEGIUM SERPENS (Hedw.) Bry. Eur. On base of tree in

* Determined by Dr. Seville Flowers.
† Determined by Dr. A. L. Andrews.

open woods. Byrd's Chapel, Lookout Valley, Dade County. Occasional.

AMBLYSTEGIUM VARIUM (Hedw.) Lindb. On moist sandy soil along stream. Lookout Mountain, Dade County. Common.

BRACHYTHECIUM OXYCLADON (Brid.) Jaeger & Sauerb. On moist bank of stream. Base of Lookout Mountain, Chattooga County; Byrd's Chapel, Lookout Valley; base of Lookout Mountain, Dade County. Occasional.

BRACHYTHECIUM RUTABULUM (Hedw.) Bry. Eur. On moist rocks by stream. Cave Springs, Wills Valley, Dade County. Occasional.

BROTHERELLA RECURVANS (Mx.) Fleisch. On moist sandy soil and rocks. Bear Creek, Lookout Mountain, Dade County. Frequent.

*CAMPYLIUM CHRYSOPHYLLUM (Brid.) Bryhn. On moist soil along streams. Byrd's Chapel, Crawfish Creek, Lookout Valley, Dade County. Occasional.

CAMPYLIUM HISPIDULUM (Brid.) Mitt. On moist soil and on rocks in stream. Byrd's Chapel, Lookout Valley, Dade County. Common.

CIRRIPHYLLUM BOSCII (Schwaegr.) Grout. On dry rocky soil. Base of Lookout Mountain, Chattooga County. Byrd's Chapel, Lookout Valley, Dade County; Pigeon Mountain, Walker County. Abundant.

CIRRIPHYLLUM PILIFERUM (Hedw.) Grout. On moist sandy soil by stream. Bear Creek, Lookout Mountain, Dade County. Occasional.

CLIMACIUM AMERICANUM Brid. On moist soil at edge of cliffs. Hooker, Lookout Valley, Dade County. Occasional.

CLIMACIUM KINDBERGII (Ren. & Card.) Grout. On soil at base of stump. Swamp near New Salem, Lookout Mountain, Dade County. Occasional.

ENTODON CLADORRHIZANS (Hedw.) C. Müll. On bases of trees and on logs. Base of Lookout Mountain, Chattooga County; Byrd's Chapel, Lookout Valley, Dade County. Common.

ENTODON SEDUCTRIX (Hedw.) C. Müll. On sandy soil. Base of Lookout Mountain, Chattooga County; Wildwood, Hooker, Lookout Valley; Lookout Mountain, Dade County; Pigeon Mountain, Walker County. Common.

EURHYNCHIUM RIPARIOIDES (Hedw.) Richards. On submerged sandstone rocks. Cole City Hollow, Sand Mountain, Dade County. Occasional.

EURHYNCHIUM SERRULATUM (Hedw.) Kindb. On moist soil on bank of stream. Byrd's Chapel, Lookout Valley; Cole City Hollow, Sand Mountain, Dade County; Base of Pigeon Mountain, Walker County. Common.

HOMALOTHECIELLA SUBCAPILLATA (Hedw.) Card. On bark of red cedar. Byrd's Chapel, Lookout Valley, Dade County. Occasional.

HYGROAMBLYSTEGIUM IRRIGUUM (Wils.) Loeske. On wet rock in stream. Cave Springs, Wills Valley, Dade County. Common.

* Determined by Dr. A. J. Grout.

HYGROAMBLYSTEGIUM ORTHOCLADON (Beauv.) Grout. On wet rock in stream. Crawfish Creek, Lookout Valley, Dade County. Common.

HYPNUM CURVIFOLIUM Hedw. On logs and moist soil in woods. Base of Lookout Mountain, Chattooga County; Wildwood, Lookout Valley; Daniel Creek, Lookout Mountain, Dade County. Abundant.

HYPNUM IMPONENS Hedw. On decaying logs. Swamp near New Salem, Lookout Mountain; Cave Springs, Wills Valley, Dade County. Common.

HYPNUM MOLLUSCUM Hedw. On sandy soil by streams. Byrd's Chapel, Lookout Valley, Dade County; Pigeon Mountain, Walker County. Occasional.

LEPTODICTYUM RIPARIUM (Hedw.) Warnst. On wet sandy soil by stream. Bear Creek, Lookout Mountain, Dade County. Occasional.

PLAGIOTHECIUM DENTICULATUM (Hedw.) Bry. Eur. On dry rocky soil on stream bank. Byrd's Chapel, Lookout Valley, Dade County. Base of Pigeon Mountain, Walker County. Common.

POROTRICHUM ALLEGHENIENSE (C. Müll.) Grout. On moist conglomerate rocks along streams. Cave Springs, Sulphur Springs, Wills Valley, Dade County. Occasional.

PYLAISIA SELWYNII Kindb. On bark of red cedar tree. Byrd's Chapel, Lookout Valley, Dade County. Occasional.

SEMATOPHYLLUM ADNATUM (Mx.) E. G. Britton. On bark of trees in open woods. Base of Lookout Mountain, Chattooga County. Byrd's Chapel, Wildwood, Lookout Valley, Dade County. Common.

SEMATOPHYLLUM CAROLINIANUM (C. Müll.) E. G. Britton. On sandstone rocks. Bear Creek, Lookout Mountain, Dade County. Occasional.

LESKEACEAE

ANOMODON ATTENUATUS (Hedw.) Hüben. On bases of trees. Base of Lookout Mountain, Chattooga County; Hooker, Wildwood, Lookout Valley, Dade County; Pigeon Mountain, Walker County. Abundant.

ANOMODON MINOR (Beauv.) Lindb. On limestone cliffs. Wildwood, Hooker, Lookout Valley, Dade County. Common.

ANOMODON ROSTRATUS (Hedw.) Schimp. On base of tree and on conglomerate rocks. Byrd's Chapel, Lookout Valley, Dade County. Base of Pigeon Mountain, Walker County. Common.

LESKEA OBSCURA Hedw. On bark of trees. Byrd's Chapel, Lookout Valley, Dade County. Occasional.

LINDBERGIA BRACHYPTERA var. AUSTINII (Sull.) Grout. On bark of red cedar. Byrd's Chapel, Lookout Valley, Dade County. Occasional.

THELIA ASPRELLA Sull. On base of trees in open woods. Byrd's Chapel, Lookout Valley, Dade County. Occasional.

THELIA HIRTELLA (Hedw.) Sull. On bark of red cedar. Byrd's Chapel, Lookout Valley, Dade County. Common.

THUIDIUM DELICATULUM (Hedw.) Mitt. On soil in open woods and over logs and tree bases. Base of Lookout Mountain, Chattooga County; Lookout Mountain, Dade County; Pigeon Mountain, Walker County. Abundant.

THUIDIUM VIRGINIANUM (Brid.) Lindb. On sandy soil in pine woods. Lookout Mountain, Dade County. Occasional.

LEUCODONTACEAE

LEPTODON TRICHOMITRION (Hedw.) Mohr. On bark of trees in open woods. Wildwood, Byrd's Chapel, Lookout Valley, Dade County. Slopes of Pigeon Mountain, Walker County. Common.

LEUCODON BRACHYPUS Brid. On bark of trees in open woods. Wildwood, Byrd's Chapel, Lookout Valley, Dade County. Slopes of Pigeon Mountain, Walker County. Abundant.

LEUCODON JULACEUS (Hedw.) Sull. On bark of trees in open woods. Byrd's Chapel, Hooker, Lookout Valley, Dade County. Abundant.

CRYPHAEACEAE

CRYPHAEA GLOMERATA Schimp. On cedar logs. Byrd's Chapel, Lookout Valley, Dade County. Occasional.

FABRONIACEAE

CLASMATODON PARVULUS (Hampe) Sull. On bark of trees in open woods. Byrd's Chapel, Lookout Valley, Dade County. Occasional.

FONTINALACEAE

*FONTINALIS NOVAE-ANGLIAE Sull. Attached to submerged sandstone rocks. Daniel Creek, Lookout Mountain, Cole City Hollow, Sand Mountain, Dade County. Common.

*FONTINALIS DALECARLICA Bry. Eur. Attached to submerged sandstone rocks. Daniel Creek, Lookout Mountain, Dade County. Common.

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DEPARTMENT OF BOTANY
UNIVERSITY OF CINCINNATI
CINCINNATI, OHIO

* Determined by Dr. Winona H. Welch.

TWO NEW SPECIES OF ACAULON FROM TEXAS

A. J. GROUT*

Mr. Robert Runyon of Brownsville has collected several interesting mosses in that vicinity and it is due him to have his name associated with the species of *Acaulon* he first collected. The spores of both new species are of extraordinary size. Those of the Austin plant are so large that at first it was suspected that they were diseased, but further study disproved this idea.

Acaulon Runyoni sp. nov. Plantae monoeciae dispersae caespitosae. Caules plantarum fructiferarum ca. 3.5 mm. alti vel foliis perichaetialibus includis ca. 6 mm. alti, cellulis corticalibus magnis, rectangulis, 40–50 μ longis, 25 μ latis. Folia inferiora parva imbricata, superiora gradatim grandiora, late ovata, 2 mm. longa vel paululum longiora, aristata, integra vel in arista paucidentata, dense chlorophyllosa, costa subpercurrenti vel percurrenti; cellulis in partibus duobus inferioribus quadratis vel rectangularis, ca. 25 μ latis, in parte folii superiore elongate hexagonis. Folia perichaetialia capsulam bulbosam teretem includentia quam caulinia grandiora, oblonge ovata, longitudine saepe 3.5 mm., arista 1 mm. longa vel breviore praedita. Antheridia in axillis foliorum inferiorum perichaetialium. Seta brevissima saepe longitudinem 0.6 mm. attingente, vaginula inclusa. Capsula sphaeroidea 1.0–1.5 mm. diametiens, absque apiculo. Sporae laeves minus quam 125 μ diam., maturitate hiemales vel vernales, membrana crassa.—Sub frutices proper locum dictum Olmito, Cameron Co., Texas, legit R. Runyon sub num. 3653, 2 Feb. 1944; specimina typica in herbario A. J. Grout.

Acaulon Runyoni sp. nov. Plants monoicous, gregarious; stems of fruiting plants about 3.5 mm. long, or to 6 mm. including the perichaetial leaves, cortical cells large, rectangular, 40–50 × 25 μ; lower leaves small and scale-like, increasing in size gradually to that of the perichaetial leaves which enclose the capsule in a bulbiform body which is not angular; upper stem leaves broadly ovate, hair-pointed and entire, or with a few teeth on the hair-point, densely chlorophyllose, 2 mm. or more in length; costa ending below the apex or entering the base of the hyaline hair-point; cells of the lower two-thirds of the leaf quadrate to rectangular, about 25 μ wide (1–1.5 : 1), in the upper third becoming oblong-hexagonal; perichaetial leaves larger, oblong-ovate, up to 3.5 mm. long, hair-point to 1 mm. long; antheridia in the axils of the lower perichaetial leaves. Seta very short, up to 0.6 mm. including the vaginule; capsule subspherical, without an apiculus, 1–1.5 mm. in diameter; spores smooth, thick-walled, up to 125 μ in diameter, maturing from winter to spring.

* Latin descriptions contributed by Professor H. H. Bartlett.

Type locality: Beneath shrubs in a thicket north of Olmito, Cameron County, Texas, Feb. 2, 1944 (*R. Runyon* 3653); type specimen in herbarium of A. J. Grout.

Acaulon megalosporum sp. nov. Plantae monoeciae dense aggregatae in caespitibus tenuibus. Caules breves, minus quam 10 mm. alti, foliis perichaetialibus inclusis, sparse radiculosi, saepe ramosi, apice perichaetialia folia in formam subbulbosam ordinata capsulam occultam includentia. Folia inferiora parva abruptius apiculata quam superiora etiamque cellulis brevioribus. Folia superiora et perichaetialia late ovata vel suborbicularia plus minusve 4 mm. longa acuminata, arista longitudine varianti praedita, distincte concava, margine propria integra sed arista breviter paucidentata, cellulis rhomboideis vel elongate hexagonis, in parte folii inferiore 100 μ longis, 20 μ latis, in parte superiore brevioribus. Capsulae subglobulares, apiculata, plerumque plus quam 1 mm. diam. Seta vix visibilis. Calyptra cylindrica, cucullata, laevis. Sporae minus quam 185 μ diam. laeves vel vix asperulae, maturitate vernales. A *A. Runyoni* specie valde simili differt plantis ramosis usque ad 10 mm. altitudine, foliis longioribus, cellulis in parte folii inferiore longioribus, capsula apiculata, et sporis multum grandioribus.—Specimina typica legit F. McAllister, prope urbem Austin, Texas, mense Junio 1941; sub num 421 in Grout, Muscis Americae Septentrionalis Perfectis.

Acaulon megalosporum sp. nov. Plants monoicous, in dense, thin sods; stems short, up to 10 mm. if the leaves are included, sometimes branched, sparingly radiculose, bearing at the summit the bulb-like cluster of leaves which inclose the capsule in fertile plants; upper and perichaetial leaves broadly ovate to suborbicular, up to 4 mm. or more in length, acuminate with a shorter or longer hair-point, very concave, entire except for a few short teeth on the hair point; costa usually extending into the hair-point; cells of the upper and perichaetial leaves rhomboidal to elongate-hexagonal, up to 100 × 20 μ in the lower part, shorter above; shorter in the lower leaves which are smaller and more abruptly apiculate. Capsules nearly globular, apiculate, mostly over 1 mm. in diameter; seta scarcely discernible; spores up to 185 μ in diameter, smooth or slightly roughened, mature in spring; calyptra (fallen) cylindrical, cucullate, smooth.

Type locality: Near Austin, Texas (*F. McAllister*, June, 1941): type specimen: Grout, "North American Musci Perfecti," Number 421.

The huge spores differentiate this from any other known species. The branching stems and apiculate capsule are unusual in the genus.

MANATEE, FLORIDA

THE DECURRENT LEAVES OF DIDYMODON TOPHACEUS

HENRY S. CONARD

Didymodon tophaceus is one of several species characterized by leaves which are similar in size, with entire margin more or less revolute, bluntly acute apex, small upper cells, finely papillose above, with more or less long rectangular cells below. It might be a *Barbula*, a *Trichostomum*, some other *Didymodon* or even a *Gymnostomum*. In fact, it has been placed in all of those genera, and also in *Hymenostylium*.

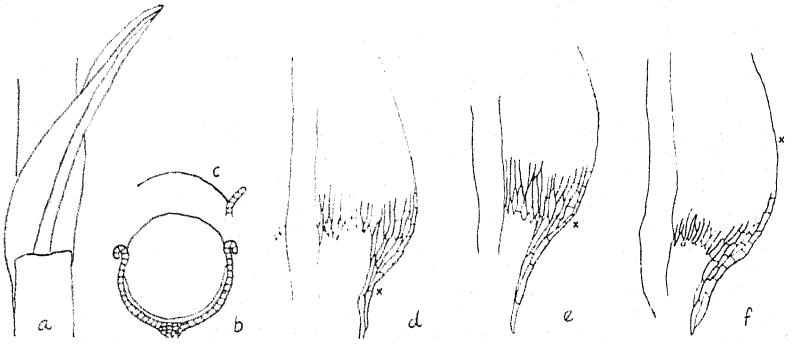

Fig. 1. DIDYMODON TOPHACEUS. a, Leaf and attachment to stem from Vendée, France (*Charrier*). b, Section of stem and base of leaf, with decurrent portion revolute. c, Similar section, not revolute. d, Base of leaf from Owen Sound, Ont. (*Moxley*). e, Same from Vendée, France. f, Same from Burlington, Iowa (*B. Shimek*). x, Point above which the margin is revolute. Drawings by Miss Louisa Sargent, Assistant Professor of Botany, Grinnell College.

An unmistakable mark of *D. tophaceus* is the manner of decurrence of the leaf, a detail easily seen but not illustrated anywhere and not mentioned in any one of the manuals except Limpricht's. In his "Laubmoose" (1: 553) we read that the stem is "durch die Blattbasen streckenweise berindet." Mr. E. B. Bartram, in a letter to me dated Aug. 26, 1941, mentions decurrent leaves as a characteristic of *D. tophaceus*.

Limpricht (l. c. 1: 554) mentions four varieties of *D. tophaceus*, and states that Boulay recognized seven forms. Moenkemeyer (Laubmoose Europas, p. 295–6) calls the plant *Barbula tophacea* (Brid.) Mitt., and gives six forms. One of these is fo. *elata* (Boulay);

another is fo. *bosniaca* (Glow.), distinguished from fo. *clata* by its long-decurrent, blunt-pointed leaves.

Cardot and Theriot (Bot. Gaz. **37**: 366; translation, THE BRYOLOGIST **8**: 10) described a variety of *D. tophaceus*, var. *decurrens*, with leaves "long decurrent." The specimen was from Texas. It is not recognized in Moss Flora of North America. The authors state that it is similar to fo. *clata*. It would seem therefore that fo. *bosniaca* and fo. *decurrens* are the same.

All my specimens of *D. tophaceus* have decurrent leaves. They are from California (2 localities), Iowa (2), Ontario, France (Vendée), Hungary. It appears that decurrent leaves are characteristic of the species, and that a "form" or "variety" based on that character is of no value.

In our figure we have attempted to show the decurrent angles of the leaf and the manner of their application to the stem. The leaf grips around the stem for about three fifths of the circumference. The revolute margins often extend half way down the decurrent portion, but the margin may be plane for some distance above the base of the leaf.

This characteristic leaf-base easily distinguishes *Didymodon tophaceus* from anything in any way resembling it in the flora of North America.

GRINNELL COLLEGE
GRINNELL, IOWA

GYROWEISIA REFLEXA IN NORTH AMERICA

HENRY S. CONARD

In a packet from the herbarium of the State University of Iowa I found some minute mosses scraped off of a limestone rock near the water of a pond in Pine Hollow, Dubuque Co., Iowa, some twenty years ago by the late Lucy M. Cavanagh. After much puzzling I placed these in *Gymnostomum tenue* of the "Moss Flora of North America" and "Mosses with Hand-lens and Microscope." Hardly able to believe my eyes I sought and received confirmation from Dr. A. J. Sharp. Meanwhile I was convinced, from the presence of an annulus and the C-shaped papillae that the plant is no *Gymnostomum*.

Examining my own herbarium I found a good *G. tenue* from Europe, but those so labeled from America proved to be *Gymnostomum cal-*

careum. I wrote to E. A. Moxley about one of these. He agreed with my correction, and sent a half of another collection from Owen Sound, once named *G. calcareum* var. *intermedium* but later *G. tenue*. Steere has had some misgivings about this one, for he found indications of a peristome. It was my good luck to find the typical peristome of *Gyroweisia reflexa* in this material, along with an annulus like that of *G. tenuis*, and also the reflexed leaves (not margins) which give the species its name. Moxley's material is *Gyroweisia reflexa*, the only known collection from North America. The locality has been blasted away, but Moxley hopes to find another lot. Good luck to him!

Dr. W. C. Steere reviewed the status of *Gyroweisia* in North America (THE BRYOLOGIST **42**: 16–23) and concluded that *G. tenuis* was then known from Lake Winnipeg, Manitoba, Houghton Co., Michigan and Owen Sound, Ontario. To these we now add Pine Hollow, Dubuque Co., Iowa, a region noted in the State for its numerous boreal plants (*cf.* Conard in THE BRYOLOGIST **35**: 28–30, 1932, and Proc. Iowa Acad. Sci. **37**: 57–61, 1932).

We add *Gyroweisia reflexa*, Owen Sound, Ontario, collected by E. A. Moxley, to the Moss Flora of North America, and subtract *G. tenuis* from the Owen Sound list of species.

GRINNELL COLLEGE AND
STATE UNIVERSITY OF IOWA

MOSSES OF STONE MOUNTAIN, GEORGIA

RUTH OLIVE SCHORNHERST

Stone Mountain, sixteen miles east of Atlanta, Georgia, is one of the geographical curiosities of the world. It is the largest exposed granite dome in North America, rising 686 feet above the surrounding Piedmont Plateau; it is seven miles in circumference at its base, and includes about 663 acres of exposed granite.

Interest in the vegetation of this monolith dates from the first ecorded visit of any naturalist, made in 1846 by the Reverend Thomas C. Porter, a Pennsylvanian who was serving a mission church in central Georgia. He collected a plant which he called *Rudbeckia Porteri*, now known as *Viquiera Porteri*, the only species of this genus in the eastern United States. Ravenel, in 1848, discovered *Quercus georgiana* on the top of the mountain, growing with *Viquiera*, and

published several notes during the next three decades, showing that he was impressed by the flora of this mountain. In 1869 W. M. Canby collected two restricted endemics, *Isoetes melanospora* and *Juncus georgianus*, and late in the nineteenth century J. K. Small added several new species from the granitic exposures found in Georgia and North Carolina. Since the turn of the century many scientists have visited the area, and Roland M. Harper, E. G. Campbell, and Rogers McVaugh have published interesting accounts of the vegetation.

During the past two years I have had occasion to work through a collection of mosses from Georgia made during the 1890's by J. K. Small. Perhaps two hundred packets bear the collection data from Stone Mountain and Little Stone Mountain (near Lithonia). A check of papers concerning Georgia vegetation has failed to produce any extensive references to the moss flora of these granite outcrops; therefore, the present paper contains the author's own list, gathered from this collection of Small's, and from specimens deposited in the herbaria of the New York Botanical Garden and the University of Michigan, with an attempt to indicate some of the interesting features found from the study.

Stone Mountain resembles an inverted bowl. On the north almost its entire area is perpendicular to the surrounding plain, and on the west and south are 45° or steeper slopes. There are few woody plants (McVaugh, 1943) but many annuals and succulents. In the water courses and shallow erosion pockets mosses and lichens abound. Growth conditions are exacting, for the sun's rays produce abnormally high summer temperatures on the south side of the mountain and abnormally low temperatures on the north. Prevailing winds also contribute to the effect of virtually two climates (Campbell, 1941). Little change in the occurrence of trees and other plants has taken place during the past century if one can judge from comparison of old and recent pictures, indicating that a state of vegetational equilibrium exists. The position of Stone Mountain in relation to the surrounding terrain may explain this static situation of the local plant population. Wulff (1943) has called attention to the isolation afforded by mountains, comparing them in this respect to islands.

McVaugh has pointed out that the phanerogamic vegetation of the granitic flat rocks of the southeastern United States presents a striking contrast to that of the surrounding old fields and forests; it consists of a small and specialized group of species of an aspect quite

different from these adjacent areas. The same observation can certainly be made concerning the mosses. *Grimmia, Drummondia,* and *Hedwigia* are characteristic of granitic surfaces, and from other locations in north Georgia as well as here, several species of *Brachythecium,* while not confined to granite, have been found growing abundantly. The author has had some experience collecting bryophytes in north Georgia, and has noticed the common occurrence of these species on granite throughout the region. Only a few species familiar to one knowing the coastal plain moss flora are included in the list. *Leucobryum albidum* and *Campylopus tallulensis,* characteristic of tropical and subtropical America, *Fontinalis Sullivantii,* a southern coastal plain species, and *Catherinaea Macmillani,* the commonest southern species of this genus, are found in company with the northern *Leucobryum glaucum,* several species of *Grimmia, Hedwigia ciliata, Drummondia clavellata,* etc. Cosmopolitan species are represented by *Bryum argenteum* and *Entodon seductrix.*

Oosting and Anderson (1942) have pointed out that the earliest effective pioneers on bare surfaces of rocks are invariably mosses; in the Piedmont *Grimmia laevigata* and *Hedwigia ciliata* are the first to appear, followed by mats of *Polytrichum* and *Campylopus* mixed with *Cladonia.* Where more moisture is available, for example around erosion pools, *Bryum bimum, Climacium Kindbergii* and *Sphagnum* sometimes develop rather extensively. Unfortunately many of Small's packets have no altitude records, so that much of the interpretation of associations must be based upon previous observations. One can almost follow Small's collecting from base to summit of the mountain, his successive collection numbers containing *Eurhynchium serrulatum, Campylium chrysophyllum, Bryum pseudotriquetrum, Thuidium delicatulum,* etc., characteristic of more moist situations which exist in the crevices formed by the accumulation of rubble around the lower reaches of the mountain, while the *Grimmiae* and *Hedwigia* are on the sunny exposed surfaces near the top of the mountain. Since most of the trees occur on the west slopes, it is not difficult to locate his collections of *Leucodon julaceus, Forsstroemia trichomitria,* or *Thelia asprella.*

McVaugh has appended to his excellent paper an annotated list of species of plants found on the granitic flat rocks of the region discussed. The bryophyte list is especially interesting in the light of Oosting and Anderson's work on successions and associations. He

includes Stone Mountain with these granitic flat rocks, but does not make any comment as to where specific collections were made when he discusses the bryophyte flora of these rocks.

Anticipated species of *Tortula*, *Barbula*, *Ditrichium*, and *Weisia* not included in Small's collection may have been overlooked or bypassed in the search for more spectacular plants. Their absence from the area would be surprising.

The author is a little surprised that no bryophyte species endemic to Stone Mountain has been found since there are at least seventeen corresponding endemic phanerogamic species. Perhaps further collecting will bring such bryophytes to light.

LIST OF SPECIES OF MOSSES FROM STONE MOUNTAIN, GEORGIA*

SPHAGNACEAE

SPHAGNUM SUBSECUNDUM

POLYTRICHACEAE

POLYTRICHUM COMMUNE
POLYTRICHUM JUNIPERINUM?
CATHERINAEA ANGUSTATA
CATHERINAEA MACMILLANI

FISSIDENTACEAE

FISSIDENS POLYPODIOIDES

DICRANACEAE

DICRANUM CONDENSATUM
DICRANUM SCOPARIUM
DICRANELLA VARIA
CAMPYLOPUS TALLULENSIS

LEUCOBRYACEAE

LEUCOBRYUM ALBIDUM
LEUCOBRYUM GLAUCUM

GRIMMIACEAE

GRIMMIA LAEVIGATA
GRIMMIA APOCARPA
GRIMMIA PENSILVANICA?
HEDWIGIA CILIATA
PTYCHOMITRIUM INCURVUM

ORTHOTRICHACEAE

DRUMMONDIA CLAVELLATA

AULACOMNIACEAE

AULACOMNIUM PALUSTRE

BRYACEAE

BRYUM BIMUM
BRYUM PSEUDOTRIQUETRUM
BRYUM ARGENTEUM

MNIACEAE

MNIUM ROSTRATUM

HYPNACEAE

BRACHYTHECIUM SALEBROSUM
BRACHYTHECIUM ACUMINATUM
BRACHYTHECIUM ACUMINATUM var. RUPINCOLA
CAMPYLIUM CHRYSOPHYLLUM
CIRRIPHYLLUM BOSCII
CLIMACIUM KINDBERGII
ENTODON SEDUCTRIX
ENTODON CLADORRHIZANS
EURHYNCHIUM SERRULATUM
HYPNUM IMPONENS
HETEROPHYLLUM NEMOROSUM
SEMATOPHYLLUM CAESPITOSUM

* Nomenclature according to Grout, List of mosses of North America north of Mexico. THE BRYOLOGIST 43: 117–131. 1940.

LESKEACEAE

THELIA ASPRELLA
THELIA LESCURII
THUIDIUM DELICATULUM
THUIDIUM MINUTULUM

LEUCODONTACEAE

LEUCODON BRACHYPUS
LEUCODON JULACEUS
FORSSTROEMIA TRICHOMITRIA var. IMMERSA

LIST OF SPECIES OF MOSSES FROM LITTLE STONE MOUNTAIN, GEORGIA

SPHAGNACEAE

SPHAGNUM IMBRICATUM
SPHAGNUM SUBSECUNDUM

POLYTRICHACEAE

CATHERINAEA ANGUSTATA
CATHERINAEA MACMILLANI

FISSIDENTACEAE

FISSIDENS CRISTATUS

DICRANACEAE

DICRANUM SCOPARIUM
CAMPYLOPUS TALLULENSIS

LEUCOBRYACEAE

LEUCOBRYUM ALBIDUM
LEUCOBRYUM GLAUCUM

AULACOMNIACEAE

AULACOMNIUM PALUSTRE

MNIACEAE

MNIUM AFFINE
MNIUM ROSTRATUM

HYPNACEAE

CAMPYLIUM CHRYSOPHYLLUM
CIRRIPHYLLUM BOSCII
ENTODON SEDUCTRIX
EURHYNCHIUM SERRULATUM
SCIAROMIUM LESCURII

LESKEACEAE

THELIA LESCURII

LEUCODONTACEAE

LEUCODON JULACEUS

FONTINALACEAE

FONTINALIS SULLIVANTII

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THE DISTRIBUTION OF FONTINALIS IN A SERIES OF MORAINE PONDS*

GENEVA SAYRE

The presence of *Fontinalis* in Colorado presents certain problems. There are now four species known in the State, and in the localities where it is found it is abundant and flourishing. But the number of localities is surprisingly small. Most Colorado mountain streams are extremely cold and swift, and it might be assumed that these are limiting factors. But Como Creek, which is full of *Fontinalis,* drops a thousand feet in less than a mile and the temperature of the water never rises much above 50 degrees F. There are dozens of streams in the vicinity of Como, with similar ecological conditions, but only two or three contain *Fontinalis.* The limiting factor would appear to be transportation from one locality to another. It seems desirable, therefore, to point out certain features in the spread of *Fontinalis* in a group of ponds which occupy an area small enough that the agents of transportation are fairly apparent.

The distribution of *Fontinalis* in these ponds is a part of a larger problem, on which a preliminary report, chiefly on invertebrates, has been made by Hugo G. Rodeck (1).

The ponds are located on a glacial moraine at about 10,500 feet on the eastern slope of the Front Range in north-central Colorado. The moraine runs roughly north and south and the ponds lie west of the crest among irregular low hills of glacial debris. There are thirty or more ponds, ranging in size from lakes 300 feet across to small seasonal puddles. The whole pond area is only about a mile long and less than a quarter of a mile wide. Thus most of the ponds are only a stone's throw from another, but they are often separated by high ridges. A dense spruce-fir forest covers the area; this, combined with the unevenness of the ground, gives the observer a sense that although the distances are small, the ponds are actually isolated from each other. The ponds are fed only by springs and rain water and so may be said to originate their own distribution routes. They exhibit all stages of biological maturity, depending upon the seasonal stability of the water level and the accumulation of humus on the originally rocky bottom and shores.

Many of the ponds contain *Fontinalis.* We have identified among our specimens *F. hypnoides* Hartm., and, as apparently more common,

* Presented at the Cleveland meeting of the Sullivant Moss Society, September 12, 1944.

the combination of characters called *F. nitida* Lindb. et Arn. I confess myself baffled by the complete gradation between these species, which may sometimes be found even on a single plant, and have availed myself of Dr. Welch's suggestion in the Moss Flora (2) that, following Cardot, *F. nitida* may be regarded as only a regional race of *F. hypnoides*. I call the species *F. hypnoides*, the older name, but am willing to believe that most, or all, of our specimens belong to the race *nitida*.

Between several ponds flow small streams, which are colonized throughout their length by another member of the Fontinalaceae, *Dichelyma falcatum* (Hedw.) Myr. We believe that *Dichelyma* is an indicator of running water, and that its presence in a dry channel means that water once flowed there in great enough quantity to transport mosses. By this *Dichelyma* test we have traced connections between about fifteen of the ponds and have designated this an avenue through which the migration of *Fontinalis* is, or was once, possible. We have found *F. hypnoides* in seven of these ponds and in three of the connecting streams. It is not present in the upper pond nor in the lower two; we suggest that it may not yet have travelled that far.

It is notably absent from the two largest ponds. Since these are the only ponds which contain *Sphagnum*, it is a temptation to say that *Fontinalis* is excluded by the acidity of the water. The water adjacent to the *Sphagnum* beds has a pH of 4.5, but the water near the opposite banks gives a neutral reaction, as does that of the other ponds. Each of these ponds is separated from the pond above by a swamp, through which at present the water has no apparent flow. But there is plenty of *Fontinalis* below, as well as above, each pond, and it seems simpler to assume that *Fontinalis* once migrated through this channel than that the *Fontinalis* below was of independent origin. The explanation would seem to lie in the fact that both ponds are mature to senescent, the rocks to which *Fontinalis* might be attached have been covered with muck, and therefore the moss has been crowded out by other plants. Two other ponds in the chain are filled with plants and their lack of *Fontinalis* is similarly explained. All the ponds which contain *Fontinalis* are ecologically younger. The remaining pond of the series supports almost no water life at all except a little green algae. For some reason as yet undetermined, conditions for colonization there must be poor.

This accounts provisionally for the fifteen ponds of this chain:

seven contain *Fontinalis;* three lack *Fontinalis* because of their remoteness; five lack *Fontinalis* because the habitat is not suitable. The distribution is believed to have occurred by floating of fragments of the plants through connecting streams, many of which have now become dry.

The rest of the ponds are not connected by regular drainage channels and the presence of *Fontinalis* is, as would be expected, discontinuous. It has been found in six scattered locations. Since its passage could be effected by neither water nor wind (the plant is submerged), some animal agency must be presumed. Elk are frequent in the vicinity, toads are common, ducks nest among the ponds. Some day we may catch a duck with *Fontinalis* on its feet, as we once found a water beetle transporting the pelecypod *Pisidium* on its leg.

Water from the moraine drains into three creeks. On the west the land pitches steeply down to North Boulder Creek and several of the ponds show evident or presumed drainage in this direction. No *Fontinalis* grows in North Boulder, and none of the ponds with connections to the creek contains *Fontinalis*. From the northeast and east flow Como Creek and Fourmile Creek. Neither of these has any evident surface connection with the ponds. No *Fontinalis* has been found in Fourmile. Como Creek, as has already been mentioned, contains abundant *Fontinalis*, but it is *F. neo-mexicana* Sull. et Lesq., and, a mile or so below, *F. antipyretica* Hedw.

There remains the question why water, birds, or other agents have not carried *F. hypnoides* to the creeks. The answer may be in the requirements of this species. On the moraine it grows in still or slowly running water. The water during the growing season approximates that of the atmosphere, which may reach as high as 80 degrees. The water in the creeks is always very swift and never warmer than 55 degrees. *F. hypnoides* is a fragile species, probably incapable of withstanding the constant buffeting of the water in the creeks.

The conclusions to be drawn at present are those which were obvious at the outset: that the distribution of *Fontinalis* depends upon a suitable habitat, and an effective means of transportation, preferably running water. We have at least shown how these factors operate in a limited area.

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BRYOLOGICAL NOTES FROM MEXICO, I[1]

AARON J. SHARP

The distribution of *Tortula pagorum* (Milde) DeNot. in the United States has been thoroughly investigated and reported upon (Anderson, 1943). There was no evidence at the time to indicate its occurrence south of Texas, Arizona and California. During the several weeks I have spent in Mexico City and Puebla, I have noted an abundance of this species on certain trees along avenues or in parks of these cities. It may be seen in large quantities following the afternoon rains, particularly on ash (*Fraxinus* sp.), occasionally on willow (*Salix* sp.) or other trees, along the Paseo de la Reforma or in Alameda or Chapultepec Parks of Mexico City. It is also relatively common in similar situations in the city of Puebla. It is frequently associated with other mosses which appear to be *Fabronia* sp., *Clasmatodon* sp. and *Tortula caroliniana* Andrews, the last occurring less frequently.

Two points are noteworthy about the occurrence of *Tortula pagorum* here. It has not previously been reported south of the United States in the Americas. Also, as Anderson (l. c.) found in his studies, it seems to be more or less restricted to sites near habitation. Searches in the field around Mexico City and in the area between that city and Puebla have failed to yield any specimens of *T. pagorum*, although more collecting in the area may reveal small quantities of it outside these cities. Thus, the thesis that *T. pagorum* is adventive in the Americas is strengthened.

It also appears that while *Bryoxiphium mexicanum* Besch. is not common, it is locally abundant on siliceous brookside boulders and bluffs in the mountains near Mexico City. It has been collected in the park, El Desierto de los Leones, and also above Contreras along Río de la Magdalena. All stations were at elevations of about 10,000 feet.

After seeing it in the field, I am further convinced that there is little if any difference between *B. mexicanum* and the *B. norvegicum* indigenous farther north. I have mentioned (Sharp, 1944[2]) their similarities elsewhere. To those previously discussed may be added the similarity in habitat. There is little apparent difference between

[1] Contribution from the Botanical Laboratory, The University of Tennessee, N. Ser. 77.

[2] In "Lilloa," I have made the new combination *Bryoxiphium norvegicum* (Brid.) Mitt. var. **mexicanum** (Besch.) Sharp. Unfortunately, I did not give the original citation, and to validate the combination in accordance with the International Rules, it is here given: *Bryoxiphium mexicanum* Besch., Journ. de Bot. **6**: 185. 1892.

the stations I have seen in Mexico and those observed in the Cumberland Mountains of eastern United States.

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12 PONIENTE No. 312
PUEBLA, MEXICO

DECAPITALIZATION OF SPECIFIC NAMES OF BRYOPHYTES

WILLIAM CAMPBELL STEERE

One of the most confusing problems which confront bryological authors today is the custom of capitalizing some species names and decapitalizing others. While reading large numbers of published and unpublished lists of bryophytes, both in the course of taxonomic and bryogeographic research, and as editor of THE BRYOLOGIST, I have had ample opportunity to realize this fact. In most of the manuscripts submitted for publication to THE BRYOLOGIST, the author has neglected to capitalize one or more species names which by tradition are capitalized, and has also capitalized one or more names which are customarily decapitalized. This observation is not intended as a condemnation of bryological authors, who certainly write as painstakingly as botanists in general, and probably more so, but only to illustrate the confusion which arises from the inconsistencies of our present usage.

The only real argument in favor of capitalization of any species name is that it is a tradition of long standing and wide usage among botanists. However, the tradition does not stand up well under close inspection, because of its many inconsistencies. Linnaeus capitalized species names derived from the names of persons, of genera, and of places, but only when he felt like it. He followed no hard and fast rule and, believe it or not, decapitalized more personal and geographic names then he capitalized. The custom of capitalizing *all* species names incorporating personal or geographic names developed during the century following the appearance of Linnaeus' "Species Plantarum" (1753). As a well-known example to illustrate this point, all geographic names are capitalized in the sixth edition of Gray's

"Manual of the Botany of the Northern United States" (1890), which contains a treatment of Hepaticae by L. M. Underwood. This custom is still revived from time to time as a Linnaean tradition by those who are unaware of the casual and haphazard usage of Linnaeus himself. However, among the great majority of professional taxonomists, the capitalization of geographical specific names has long been totally abandoned, and we are so accustomed to their decapitalization that *Bryoxiphium Norvegicum, Hygrohypnum Novae-Caesareae, Sphagnum Magellanicum,* and *Lejeunea Floridana* will catch our eye as not only unusual but contrary to custom. Our present usage is determined (in theory!) by a recommendation in the most recent (third) edition of "International Rules of Botanical Nomenclature" (Jena, 1935). Recommendation xliii, under Article 70 of Section 13 (Orthography of Names), says (p. 24): "Specific (or other) epithets should be written with a small initial letter, except those which are derived from names of persons (substantives or adjectives) or are taken from generic names (substantives or adjectives)."

In the first place, it should be noted that our usage is determined by a recommendation, not a rule, and in the second place that our trend toward decapitalization has already progressed beyond the literal interpretation of the very recommendation concerned with it. To illustrate, we have already abandoned the capitalization of specific names which are adjectival forms "taken from" generic names.

Fortunately, bryologists do not apply the above recommendation any more seriously than botanists working on vascular plants, or they would have to capitalize hundreds of species now decapitalized, of which the following are well-known examples: *Fissidens adiantoides, F. osmundioides, F. polypodioides, F. splachnobryoides, Plectocolea fossombronioides; Hypnum cupressiforme; Thuidium abietinum; Calypogeia sphagnicola; Fissidens daltoniaefolius, F. splachnifolius, F. sphagnifolius* and *Tortula mniifolia.* In other words, we are not now following in its entirety a recommendation formulated as recently as 1935, and will sooner or later cease to follow other parts. Generic names used as names of species, as in *Hyophila Tortula* and *Gyroweisia Barbula,* are puzzling to the eye when capitalized, especially in the quick perusal of an index or list, as they are apt to be mistaken for genera. Species names composed of generic names in the genitive case, as in *Hypopterygium Tamarisci* and *Odontoschisma Sphagni* are

almost as confusing, in the same way, as undeclined generic names. This situation is enormously complicated by the fact that some species names, as descriptive adjectives, resemble or exactly duplicate generic names, and it is only the caprice of the original author which determines whether or not such names shall be capitalized. What general botanical editor, even though well-informed on cryptogamic genera, would know offhand whether or not to capitalize any of the following species names: *Orthotrichum gymnostomum, Brachymenium systylium, Mnium hymenophyllum, Campylium chrysophyllum, Leptodictyum trichopodium, Heterocladium heteropterum, Thuidium schistocalyx, Leptodon trichomitrion, Fabronia gymnostoma, Fontinalis chrysophylla, Blepharostoma trichophyllum, Jungermannia sphaerocarpa, Nardia geoscyphus, Diplophyllum taxifolium, Targionia hypophylla, Riccia dictyospora* and *R. trichocarpa?* The fact is that all the names listed were proposed as descriptive adjectives, with no intention of referring to names of genera which they might resemble or duplicate, and so none of them should be capitalized. The resemblance of geographic names to personal names is likewise baffling to the uninitiated. What general botanical editor, without looking up the original description, would know whether or not to capitalize any of the following species names: *Sphagnum henryense, Macromitrium elizabethae, Bryum alexandri, B. catharinae, B. lawersianum,* and *B. melvilleanum?* It happens that all of them are based on geographic names (Cape Henry, Elizabeth Island, Alexandrine Alps, Santa Catharina, Ben Lawers, Melville Island), and should not be capitalized, even by the strictest interpretation of the International Rules. A cursory inspection of Paris' "Index Bryologicus" (1905) will demonstrate dozens of similar cases, and at the same time show conclusively the appalling lack of consistency in our capitalization of specific names. The bryologist who must prepare long catalogues of names and the editor who must review them is forced to spend a good deal of unproductive time, in the interests of accuracy, in looking up original descriptions, just to discover whether a name should or should not be capitalized.

In summary, then, the primary argument for the capitalization of specific names of plants derived from personal names (and generic names) is the traditional but haphazard usage. The principal arguments against capitalization are: 1) Capitalization of a small proportion of specific names sets them off with a false emphasis, whereas decapitalization would give complete consistency. 2) The recommen-

dations concerning capitalization in the International Rules are ambiguous, subject to conflicting interpretations, and not applied literally even in the Rules themselves. 3) Hundreds of names not now capitalized must be capitalized if the present wording of the rules is followed to the letter. 4) There is a tendency to change rules and usage, so that from decade to decade different groups of names have been capitalized (geographic species names now decapitalized, vernacular names used as species names now capitalized). 5) Capitalization causes a good deal of troublesome, thankless, and unproductive labor in the determination of which names should be capitalized under the Rules. 6) The same word may be capitalized or decapitalized as a species name, according to whether it originates from a personal or a geographic name, or from a genus name or a word accidentally duplicating a genus name.

From the foregoing, it is obvious that uniform decapitalization would increase efficiency, reduce labor, and simplify procedure for bryologists. For the past fifty years the United States Government Printing Office has been issuing all botanical literature with decapitalized specific names, with no apparent injury to science. Frye and Clark's important work, "The Hepaticae of North America" (1937–1943), decapitalizes all specific names, and rather than diminishing its usefulness as a manual thereby, it is perhaps more easily used by amateurs. I am convinced that our present trend is toward complete decapitalization, a condition reached by zoologists and geologists a half century ago. Bryologists must be prepared to decide their position on this question, as at the next International Botanical Congress (whenever that may be), a recommendation will certainly be proposed to decapitalize all species names of plants.

I hope that even though the reader may not agree with the view which I have taken or the points which I have raised, he may at least be more aware of the problem, as well as of the basis for his own position. To those who wish more detailed information, I can recommend the articles of Beetle and Wiltshire, in Chronica Botanica (7: 380–381. 1943) and Transactions of the British Mycological Society (27: 9–10. 1944), respectively. Unfortunately, the thoughtful and comprehensive paper on this topic presented before the American Botanical Society at Philadelphia, in 1940, by Dr. S. F. Blake has never been published. I am indebted to Dr. Blake for the loan of his manuscript, from which came some of the information and several of the ideas presented here.

THE FORAY AT COLUMBUS, OHIO, SEPTEMBER, 1944

HENRY S. CONARD

The value of a Foray as an all-round stimulus to a bryologist is so great that it was deemed wise to have such a field trip on September 16, 1944, immediately following the A. A. A. S. and Sullivant Moss Society meetings at Cleveland. The party gathered at Columbus on the evening of Sept. 15, the day that Vice-President T. C. Frye was 75 years of age. Arrangements had been made in advance for hotel accommodations. Four of us dined together, visited, ordered lunch for Saturday, and went early to bed.

Doctors Blaydes and Meyer of Ohio State University gathered the hotel group in their cars on Saturday morning for a 60-mile drive to the Hocking Valley and Sugar Grove area. Many aspects of this region have been studied by students from Ohio State and other universities, and by many amateurs. Since the pioneer study by Griggs numerous papers have been published describing the flora, fauna and geological history of the region. Microclimatic and floristic studies are still in progress.

The first glacial ice, undoubtedly pre-Illinoian, dammed the streams flowing north out of the region which created parts of a pro-glacial lake known as Tite Lake. Subsequent drainage of this lake was followed by stream reversal, and a "deep stage" not yet satisfactorily explained, during which the present main streams were cut in some instances more than 150 feet below their present level. The valleys were later filled with glacial gravels on which the present streams flow, except in their upper reaches. Many of these smaller streams now flow in deep canyons with vertical walls of sandstone and conglomerate. The region abounds in shallow caves produced by weathering of these rocks. The rock in the region visited is the Blackhand Sandstone, coarse and hard, the particles being cemented with silica and oxide of iron. Thus it differs radically from the porous St. Peter Sandstone of Starved Rock, Ill., and the calcareous Palaeozoic sandstones of Iowa.

The first stop was in southern Fairfield County at a wooded bank facing north, among birch, maple and hemlock trees, the most southern locality in Ohio for *Rhytidiadelphus triquetrus*.

At Rock House State Park, *Ephemerum crassinervium* was found along a path, and in the gorge all who wished it secured *Bryoxiphium*. Rock House is a cavernous overhang on the wall of a canyon, with several pillars of rock supporting the roof. *Brachythecium rivulare*,

Fissidens minutulus and *Porotrichum alleghaniense* were found in the moist gorge, while earth and rocks were everywhere carpeted with commoner species: *Dicranum scoparium* c. fr., *Leucobryum glaucum*, etc.

After lunching at Rock House Park we proceeded to Conkle's Hollow. This is a series of box canyons headed by impassable waterfalls. On the brink of the canyon *Dicranum spurium* and *D. congestum* are abundant. *Fontinalis novae-angliae* inhabits temporary rock rivulets. *Andreaea rupestris* was abundant and fruiting on the edge of the cliff at one spot, and *Brothera Leana* was found nearby on a rotten log. *Rhacomitrium heterostichum* var. *sudeticum* is abundant on the rocks where spring rains and melting snow produce temporary seepage.

We descended into the uppermost box canyon by climbing down a broken place in the cliff with the aid of a rope. On the wall here grows the distinctly southern *Syrrhopodon texanus*, and under a dripping ledge *Mnium hornum* is abundant. Both *Homomallium adnatum* and *Sematophyllum carolinianum* grow on the rocks, and along the stream several square yards of *Sematophyllum marilandicum* were found, fruiting—a new species for the State and an extension of the known range to the west.

Ten persons made this field trip, and at Columbus Dr. Transeau was waiting to welcome us to the Botany Department of Ohio State University. In an upper room we found microscopes ready, so we had all questions of identification settled before bedtime.

Sugar Grove was a favorite collecting ground for Sullivant and Lesquereux. On one cliff we saw *Sullivantia Sullivantii*. The next day two of the party journeyed to Yellow Springs, via Springfield, Ohio, to see the locality of the long-lost *Leptodon ohioense*. We found John Bryan State Park a mile east of Yellow Springs, and spent a short time along the creek and in one of the lateral box canyons. This is a limestone country, and the rocks are covered with *Anomodon attenuatus* and *A. rostratus* as in the limestone areas of Iowa. The trees carry *Anomodon minor*, *Leskea gracilescens*, *Platygyrium repens*, and occasionally *Leucodon julaceus*, and on wet walls of rock near a waterfall are sods and cushions of *Gymnostomum recurvirostrum*, some of which was fruited. With more time, and a guide, we should have found *Hyophila Tortula* and *Rhytidium rugosum*, but no one has seen the *Leptodon* since Sullivant.

The thanks of all participants of this Foray were cordially rendered to Dr. Wareham for the detailed care with which all arrangements

were made and carried out, for his generous sharing of his rarest moss treasures, and for a check list of the mosses of Hocking County, Ohio. Special thanks are also due to Drs. Blaydes and Meyer of Ohio State University for the generous contribution of their cars, tires, gasolene and skillful driving. Present on the Foray were H. S. Conard, President of S. M. S., T. C. Frye, Vice-President, W. H. Welch, Secretary-Treasurer, R. T. Wareham, Director of the Moss Exchange Club, C. W. Dodge, Curator of Lichens, G. W. Blaydes, B. S. Meyer, Mrs. L. K. Frehse, and Messrs. Bartley and Pontius of Circleville, Ohio.

GRINNELL, IOWA

NOTICE OF PUBLICATION—Annales Cryptogamici et Phytopathologici (incorporating Annales Bryologici), edited by Frans Verdoorn, published by the Chronica Botanica Company, Waltham, Massachusetts. Volume I (1944) of this excellently edited and printed new series of publications has just appeared, being "Root Disease Fungi: A Treatise on the Epidemiology of Soil-borne Disease in Crop Plants, and a First Exposition of the Principles of Root Disease Control," by S. D. Garrett, Mycologist of the Rothamsted Experimental Station, England. Dr. Verdoorn has established this new serial as a means of publishing memoirs (each forming a separate volume) devoted to general and systematic cryptogamy and to phytopathology. Volume II, already in press, will be Horsfall's "Fungicides." Dr. Margaret Fulford's long- and eagerly-awaited monograph, "The Genus *Bazzania* in Central and South America," is now in press and will form Volume III. Bryologists join in hoping that Dr. Fulford's important work may appear soon.—W. C. S.

NEWS FROM FRANCE—From Paris we have just received, with sincere regret, the following note (dated November 10, 1944): "Mrs. Pierre Allorge, the staff of the Laboratoire de Cryptogamie (Muséum National d'Histoire Naturelle), the scholars and friends of Professor Pierre Allorge, deeply grieved, beg to inform you of his death, which occurred on January 21st, 1944, consecutive to a long illness. A necrological notice will be sent to you at a later period." Dr. Allorge was well known to American bryologists as editor of "Revue Bryologique et Lichénologique," and for his contributions to the bryology of Spain, Portugal, and the Atlantic Islands. Dr. Frans Verdoorn has received word from Mrs. Suzanne Jovet, assistant in the Laboratoire de Cryptogamie, of the recent death of G. Hamel and that Roger Heim is a prisoner in the Tyrol. She writes further that Thériot's herbarium has not been damaged but that there is apprehension concerning Hue's lichen collection.—W. C. S.

Volume 47, Number 4, containing pages 137–208, was issued January 23, 1945.

THE BRYOLOGIST

JOURNAL OF

THE SULLIVANT MOSS SOCIETY

VOL. 48 JUNE, 1945 No. 2

PACIFIC OUTPOST MOSSES

EDWIN B. BARTRAM

During the past few years I have received through the courtesy of the Bernice P. Bishop Museum collections of mosses from several small islands in the Pacific area that have recently figured prominently in the world news. Since some of these localities may have been more or less devastated by war activities it seems worth-while to list the material in detail as a matter of record. These notes in connection with those given by Dixon in his paper on "War Zone Mosses"[1] give a bare outline of the moss flora of some of the little known and rarely visited islands of Oceania.

If a handful of our men scattered over the far-flung reaches of the Pacific can profit by their opportunities and manage to collect a few mosses in their spare time the effort will be well rewarded as these collections should be of great value in piecing out the intricate pattern of plant distribution in one of the most interesting botanical regions of the world. Leisure hours devoted to such undertakings are bound to return big dividends.

Types of the new species are in the writer's herbarium and duplicates in the herbarium of the Bernice P. Bishop Museum, Honolulu, Hawaii, unless otherwise noted.

PALMYRA ISLAND

CALYMPERES TENERUM C. M. On *Tournefortia* trees and coconut palms, *E. H. Bryan, Jr.*, Aug. 12, 1938.

Distribution: Wide, India to Hawaii.

[1] THE Bryologist **46**: 14–22. 1943.

DANGER ISLANDS

LEUCOPHANES ALBESCENS C. M. Pupapuka, "limu puniu," *E. Beaglehole 55*, April 1935. *E. H. Bryan, Jr.*, Feb. 29–Mar. 3, 1924.

SWAIN'S ISLAND (Samoa)

MEIOTHECIUM MICROCARPUM (Harv.) Mitt. On trunks of coconut palms, alt. 3–4 meters, *E. H. Bryan, Jr., 925b*, April 6, 1935.

Distribution: Wide, India to Samoa.

ECTROPOTHECIUM SANDWICHENSE (Hook. & W. Arn.) Mitt. Coll. *P. T. Diefenderfer*, 1930?; On trunks of coconut palms, *E. H. Bryan, Jr., 925*, Apr. 6, 1925.

Distribution: New Zealand to Hawaii.

ROTUMA ISLAND (Lat. 12° 30′ S., Long. 177° 05′ E.)

LEUCOPHANES SMARAGDINUM (Mitt.) Par. Kilinga, Itutin District, on tree trunk, alt. 250 ft., *Harold St. John 19040*, July 4, 1938.

Distribution: Pacific Islands.

EXODICTYON DENTATUM (Mitt.) Card. Jarua, Itutin District, on saturated soil in swamp, *Harold St. John 19254, 19256*, July 23, 1938.

Distribution: Tahiti, Samoa, Fiji, New Hebrides, New Caledonia.

PELEKIUM VELATUM Mitt. Kilinga, Itutin District, on moist shaded rocks, alt. 15 ft., *Harold St. John 19080*, July 8, 1938.

Distribution: Wide, Malaysia to Samoa.

THUIDIUM PLUMULOSUM (Dozy & Molk.) Bryol. Jav. Vaitoko, Oinafa District, moist forest on basalt rocks, alt. 50 ft., *Harold St. John 19752*, Aug. 26, 1938.

Distribution: Wide, Ceylon to Fiji.

ISOPTERYGIUM MINUTIRAMEUM (C. M.) Jaeg. Jarua, Itutin District, on saturated soil in swamp, *Harold St. John 19253*, July 23, 1938.

Distribution: Malaysia and Australia to Fiji and Marquesas Islands.

VESICULARIA INFLECTENS (Brid.) C. M. Pano, Itutin District, on damp rocks in forest, alt. 300 ft., *Harold St. John 19447*, Aug. 8, 1938.

Distribution: Hong Kong, Borneo, Pacific Islands to Tahiti.

Vesicularia hamata Bartr. sp. nov. Sat robusta, straminea, nitida. Caulis elongatus, laxe et irregulariter ramosus, ramis ad 12 mm. longis. Folia haud conferta, falcata, prope apicem valde hamata, ad 2 mm. longa, 0.5 mm. lata, ovato-lanceolata, longe acuminata, subintegra; cellulae angiste lineares, infimae laxiores. Caetera ignota.

Rather robust, pale yellowish green, glossy plants in lax mats. Stems elongate, laxly and irregularly pinnate, branches to 12 mm. long. Leaves not crowded, slightly falcate, hamate at tips of stems and branches, to 2 mm. long, 0.5 mm. wide, subentire, ecostate; cells narrowly linear, about 10 : 1, shorter and laxer near insertion. Fruit unknown.

Jarua, Itutin District, on saturated soil in swamp, *Harold St. John 19260*, July 23, 1938.

Possibly near *V. Kurzii* (Lac.) Broth. of Java and Banca but distinct from any of the species in this group by the falcate leaves and hooked tips of the stems and branches.

TAU, MANUA ISLANDS (Eastern Samoa)

LEUCOPHANES PUNGENS Fleisch. Tunoa Peak, summit, ridge, medium damp, 1/8 mile from shore, alt. 630 ft. growing on dead logs in forest, *Wray Harris 262b*, Sta. 51, Sept. 23, 1936.

Distribution: Samoa.

LEUCOPHANES CANDIDUM (Hornsch.) Lindb. North slope of Lepue, near summit of cone, under cover of forest, on lava boulder, 1/3 mile from shore, alt. 950 ft., *Wray Harris 1759*, Aug. 7, 1927.

Distribution: Wide, Ceylon to Samoa.

EXODICTYON SCABRUM (Mitt.) Card. Faleulu draw, hillside, in native forest on living tree trunks, damp, 1 mile from shore, alt. 1600 ft., *Wray Harris 236a*, Sta. 52, Sept. 24, 1936.

Distribution: Samoa, Fiji.

CALYMPERES SAMOANUM Besch. Judd's Crater, N. W. rim, on trunks and limbs of trees, in damp, rather open forest, 3/4 mile from shore, alt. 560 ft., *Wray Harris 413, 414*, July 27, 1938. On coconut trees, 250–300 m. alt., *T. G. Yuncker 9243*, Oct. 4, 1939.

Distribution: Samoa.

CALYMPERES STRICTIFOLIUM (Mitt.) Roth.

Syn. *Calymperes tuberculosum* (Dix. & Thér.) Broth.[2]

Tavalogi Ridge, west end, ridge summit, under light forest cover, north face of tuff capping, medium damp, 1/8 mile from sea, alt. 475 ft., *Wray Harris 931a*, Sta. 75, June 28, 1937.

Tavalogi Ridge, west end, north face, summit of ridge, cliff face, under forest, medium dry, on tuff rock, 1/8 mile from shore, alt. 370 ft.; *Wray Harris 931a*, Sta. 75, Dec. 4, 1937. Faleulu Valley, 1/8 mile south of Muao's fale. Growing on dead logs and fallen wood

[2] New and noteworthy Philippine Mosses. Farlowia 1 (4): 505. 1944.

lying on moist soil under cover of light forest, hillside, gentle slope, ¾ mile from shore, alt. 710 ft., *Wray Harris 2489*, Sta. 262, July 27, 1938.

Distribution: Borneo, Philippines, Fiji, Samoa.

CALYMPERES TAHITENSE (Sull.) Mitt. Judd's Crater, N. W. rim, on trunks and limbs of trees in damp, rather open forest, ¾ mile to shore, alt. 560 ft., *Wray Harris 2519*, Sta. 79, July 27, 1938. Upper Luma Plantation, E. of pig fence, alongside Vaosa trail, 2–10 ft. above ground on trunks of coconut and breadfruit trees, ¾ mile to shore, *Wray Harris 2466*, Sta. 263, July 27, 1938. Faleulu Valley, ⅛ mile south of Muao's fale, ¾ mile from shore, alt. 680 ft., *Wray Harris 423, 439*, July 27, 1938.

Distribution: Java, Borneo, Philippines, Fiji, Tahiti.

HYOPHILA INVOLUTA (Hook.) Jaeg.

Syn. *Hyophila samoana* Mitt.

Faleasao, old beach flats, middle section behind Fale popo, growing on tuff rock at lower edge of talus, under plantation trees, damp, 450 ft. from shore, alt. 15 ft., *Wray Harris 2125*, Sta. 189, Oct. 10, 1937.

Distribution: India, Eastern China and probably wide through the Pacific islands.

As I have remarked before[3] *H. involuta* probably has a quite extensive synonymy including a number of closely related species ranging through the Pacific islands to Hawaii.

MNIOMALIA SEMILIMBATA (Mitt.) C. M. Judd's Crater, midway between bottom of pit and N. W. rim, under forest and plantation cover, on talus below cliff, on rotten log, damp, alt. 450 ft., *Wray Harris 2132*, Sta. 236, Dec. 18, 1937. Luma, cliffs east of Dispensary, open forest, medium damp, 1500 ft. from shore, alt. 130 ft., on lava boulders, *Wray Harris 51*, July 24, 1938.

Distribution: Sumatra, Borneo, New Guinea, Philippines, Samoa.

SPIRIDENS ARISTIFOLIUS Mitt. Faleutu Draw, damp shallow draw on steep mountainside, in forest, growing on tree trunks 1–8 ft. above ground, 1½ miles from shore, alt. 1800 ft., *Wray Harris 211*, Sta. 39, Sept. 19, 1936. Faleulu Valley, ⅛ mile s. of Muao's fale, on dead logs and sticks lying on moist soil, gentle slope, hillside, ¾ mile from shore, alt. 720 ft., *Wray Harris 114*, July 27, 1938. On tree in moist forest, west slope of Mt. Vaoaimanu, alt. 450 m., *T. G. Yuncker 9258*, Oct. 5, 1939.

Distribution: Samoa, Fiji.

[3] Mosses of the Philippines. Philipp. Journ. of Science 68: 114. 1939.

PINNATELLA KUHLIANA (Lac.) Fleisch. Afuli-Fagamolo beach trail, forest cover is strand trees (mostly fau and futu), lava boulders in talus below shore cliffs, 30 ft. from upper beach line, alt. 20 ft., *Wray Harris 686a*, Sta. 103, April 9, 1937.

Distribution: Sumatra, Java, Ceram, Philippines, Celebes, New Guinea, Fiji, Samoa, Tahiti.

PELEKIUM VELATUM Mitt. Tavalogi Ridge, west end, ridge summit, under light forest cover, north face of tuff capping, medium damp, 1/8 mile from shore, alt. 476 ft., *Wray Harris 931*, Sta. 75, June 28, 1937.

VESICULARIS INFLECTENS (Brid.) C. M. S. side of South Cove, Papatea, rocky point, foot of hill, lower edge of strand forest, at beach, on tuff rock, 5–20 ft. from shore, alt. 10–15 ft., *Wray Harris 313*, July 15, 1938. Afuli-Fagamolo beach trail, forest cover is strand trees (mostly fau and futu), on lava boulders in talus below shore cliffs, 30 ft. from upper beach line, alt. 20 ft., *Wray Harris 686a, 685a*, Sta. 103, April 9, 1937. Judd's Crater, bottom of pit, on lava boulders, under cover of shrubs, fern and mixed plantation and forest trees, 1/2 mile from shore, alt. 380 ft., *Wray Harris 2129*, Sta. 20, Dec. 18, 1937.

VESICULARIA TAHITENSIS (Aongstr.) Broth. Judd's Crater, N. W. rim, spur rim, S. exposure, under light forest cover of tree ferns and other trees, cliff face, growing on volcanic cinders, 1/2 mile from shore, alt. 550 ft., *Wray Harris 1764b*, June 17, 1937.

Distribution: Rapa, Pitcairn Island, Tahiti.

CAROLINE ISLANDS

SYRRHOPODON BANKSII C. M. Ex herb. E. Bailey.

Distribution: Society Islands, Cook Islands, Tuamotus Archip.

SYRRHOPODON GRAEFFEANUS C. M. Ponape Island: Nan-a-lant, on tree trunks, *Masahiko Takamatsu 1074a*, Feb. 17, 1936.

Distribution: Fiji.

CALYMPERES THYRIDIOIDES Broth. Ex Herb. E. Bailey (wrapped in N. Y. City newspaper dated June 25, 1857). *No. 101m*, collector unknown.

CALYMPERES SERRATUM Al. Br. Ponape Island: Tolomail, on tree trunks among basal scales of epiphytic fern, *Masahiko Takamatsu 950b*, Feb. 11, 1936.

Distribution: Malaysia, Eastern China, Philippines, New Caledonia, Fiji, Samoa.

EXODICTYON BLUMII (C. M.) Fleisch. Ponape Island: Tolomail, in palm forest, *Masahiko Takamatsu 981a*, Feb. 11, 1936.

Distribution: Java, Borneo, Philippines.

LEUCOPHANES OCTOBLEPHARIOIDES Brid. Yap Island: Takiol, on tree trunks, *Masahiko Takamatsu 1846a*, May 18, 1936.

Distribution: Wide, Nepal to Pacific Islands.

LEUCOBRYUM SANCTUM Hampe. Ponape Island: Mt. Nan-a-lant, on decomposed trees, *Masahiko Takamatsu 1094a*, Feb. 17, 1936.

Distribution: India and Malaysia to Fiji and Samoa.

LEUCOPHANES ALBESCENS C. M. *No. 103m*, collector unknown.

SPIRIDENS BALFOURIANUS Grev. Ponape Island, Tolomail, on tree trunks, *Masahiko Takamatsu 963a*, Feb. 11, 1936.

Distribution: Society Islands, Fiji, Rapa.

MACROMITRIUM SUBULIGERUM (Bryol. Jav.) Fleisch. No. *106m*, collector unknown.

Distribution: Java, Celebes, Philippines, Tahiti.

ENDOTRICHELLA NEMATOSA Bartr. Ponape Island: Kuporujo, on top of the mountain, on epiphytic fern, *Masahiko Takamatsu 661a* (type), March 13, 1936.[4]

ENDOTRICHELLA ELEGANS (Dozy & Molk.) Fleisch. Mt. Matante, on tree trunks, *No. 557c*, Jan. 22, 1926.

Distribution: Sumatra, Java, Malacca, Philippines, Annam, Formosa.

AEROBRYOPSIS LONGISSIMA (Dozy & Molk.) Fleisch. Kusaie Island: Mt. Matante, hanging from tree trunks, *Masahiko Takamatsu 556a*, Jan. 22, 1936. Ponape Island: Tolomail, on tree trunks, *Masahiko Takamatsu 963b*, Feb. 11, 1936.

Distribution: Wide, India and Ceylon through Patific islands to Hawaii.

NECKEROPSIS GRACILENTA (Bryol. Jav.) Fleisch. Kusaie Island: Mt. Matante, on tree trunks, *Masahiko Takamatsu 557b*, Jan. 22, 1936.

Distribution: Sumatra, Java, Celebes, Borneo, Philippines, New Guinea, Samoa.

THUIDIUM GLAUCINOIDES Broth. Ponape Island: Tolomail, in palm forest, *Masahiko Takamatsu 981a*, Feb. 11, 1936.

Distribution: Burma, Tonkin, Malaysia, Formosa, China, New Hebrides, Fiji, Samoa.

[4] New and noteworthy Philippine Mosses. Farlowia 1 (4): 507. 1944.

SEMATOPHYLLUM MICROCLADUM (Dozy & Molk.) Broth. Ex herb. E. Bailey, collector unknown.

Distribution: Borneo, Celebes, New Guinea.

ACROPORIUM BREVISETULUM (C. M.) Jaeg. Ponape Island: Mt. Nan-a-lant, on trees in forest, *Masahiko Takamatsu 1095*, Feb. 17, 1936.

Distribution: Samoa.

Possibly only a form of *A. sigmatodontium* (C. M.) Fleisch.

Ectropothecium ponapense Bartr. sp. nov. Lutescenti-viride, sericeo-nitidum. Caulis elongatus, pinnatum ramosus, ramis late patentibus, 6–7 mm. longis, parce complanatis. Folia leniter falcatula, 1.5–2 mm. longa, ovato-lanceolata, concava, sensim longe acuminata, brevissime bicostata; margines erecti, fere ubique fortiter serrati; cellulae anguste lineares, dorso ad angulos apicales spiculoso-papillosae, alares paucae, magnae, pellucidae. Fructus ignotus.

Yellowish or golden-green plants with a silky sheen, growing in lax tufts. Stems elongate, pinnately branched, branches widely divergent, 6–7 mm. long, somewhat complanate. Leaves slightly falcate, 1.5–2 mm. long, ovate-lanceolate, concave, gradually long acuminate, shortly bicostate; margins erect, strongly and sharply serrate nearly to base; cells narrowly linear, prominently spiculose-papillose on the back by the projecting cell angles, alar cells few, large and pellucid. Fruit unknown.

Ponape Island: Tolomail, on tree trunks, *Masahiko Takamatsu 950a*, Feb. 11, 1936.

A handsome little moss probably nearest *E. incubans* (Reinw. & Hornsch.) Jaeg. but conspicuously glossy and often golden-yellow in color. The leaf cells are also much narrower.

Ectropothecium diversirete Bartr. sp. nov. Pallide viride, laxe caespitosum, nitidum. Caulis 3–4 cm. longus, irregulariter et laxe pinnatum ramosus. Folia late patentia, leniter falcatula, circa 1.5 mm. longa, e basi abrupte contracta late ovata, sat abrupte acuminata, ecostata, fortiter concava, scariosa; margines erecti, superne serrati, fere ad basin minute denticulati; cellulae laevissimae, anguste lineares, 1 : 16–20, apicales breviores, lineari-rhomboideae, basilares laxiores, alares paucae, magnae, hyalinae. Caetera ignota.

Plants pale green, glossy, growing in intricate, lax tufts. Stems 3–4 cm. long, laxly and irregularly pinnate. Leaves widely spreading, scariose, slightly falcate, about 1.5 mm. long, broadly ovate from a conspicuously contracted base, rather abruptly acuminate, ecostate, strongly concave; margins erect, serrate above, minutely denticulate below; cells smooth, very long and narrow, about 1 : 16–20, shorter and linear-rhomboidal in the acumen, laxer toward insertion, alar cells few, large and hyaline. Fruit unknown.

Distinct from any of the species of this intricate genus that I am familiar with in the abruptly contracted leaf base and the very long, narrow lamina cells, appreciably shorter in the apex and laxer near the insertion.

Ponape Island: Tolomail, on moist ground under trees, *Masahiko Takamatsu 954a*, Feb. 11, 1936.

VESICULARIA INFLECTENS (Brid.) C. M. Ponape Island: Param, in dark places, *Masahiko Takamatsu 643a*, Feb. 8, 1936.

THYRIDIUM FASCICULATUM (Hook. & Grev.) Mitt. Palau Islands: Gaspan, on tree trunks, *Masahiko Takamatsu 1282a*, Apr. 27, 1936.

MARIANAS ISLANDS

CALYMPERES TAHITENSE (Sull.) Mitt. Guam: N. of Almagosa, on trees in moist limestone forest which caps the volcanic hills, alt. 320 m., *E. H. Bryan, Jr. 1228 in part*, Apr. 21, 1936.

LEUCOPHANES SMARAGDINUM (Mitt.) Par. Guam: Machanao Dist., on trunks of trees in moist limestone forest, alt. 110 m., *E. H. Bryan, Jr., 1192*, Apr. 16, 1936.

MACROMITRIUM SEMIPELLUCIDUM Dozy & Molk. Guam: Machanao Dist., on tree trunks in moist limestone forest, alt. 110 m., *E. H. Bryan, Jr. 1191a*, Apr. 16, 1936.

Distribution: Sumatra, Borneo, Philippines, New Guinea.

PAPILLARIA INTRICATA (Mitt.) Jaeg. Guam: Machanao Dist., on tree trunks in moist limestone forest, alt. 110 m., *E. H. Bryan, Jr. 1186b, 1189, 1193a*, Apr. 16, 1936.

Distribution: Solomon Islands, Fiji, Samoa.

THUIDIUM PLUMULOSUM (Dozy & Molk.) Bryol. Jav. Guam: Ritidian Point, on tree trunks in moist forest, limestone slope, alt. about 50 m., *E. H. Bryan, Jr. 1161*, Apr. 16, 1936.

MEIOTHECIUM MICROCARPUM (Harv.) Mitt. Guam: Machanao Dist., on trunks of trees in moist limestone forest, alt. 110 m., *E. H. Bryan, Jr. 1191*, April 16, 1936.

ECTROPOTHECIUM INCUBANS (Reinw. & Hornsch.) Jaeg. var. SCABERULUM (Broth.) Fleisch. Guam: N. of Almagosa, on trees in moist limestone forest which caps the volcanic hills, alt. 320 m., *E. H. Bryan, Jr. 1228 in part*, Apr. 21, 1936.

Distribution: Java, Borneo, Samoa.

SUMATRA

Pseudoracelopus armatus Bartr. sp. nov. *P. philippinensi* affinis, differt caulibus longioribus, ad 5 cm. altis; foliis acutioribus, superne spinoso-serratis.

Near *P. philippinensis* Broth. but distinct in the longer stems and more acutely pointed leaves with the margins coarsely spinose-serrate toward apex.

Stems to 5 cm. high. Leaves to 6 mm. long and about 1 mm. wide, sharply acute, coarsely serrate toward apex with large, spine-tipped teeth. Seta 3 cm. long, papillose throughout; capsule inclined, about 2 mm. long, contracted below the wide, flaring mouth; calyptra densely pilose with deflexed hairs, covering the capsule.

Sumatra East Coast: vicinity of Loemban Ria, Asahan. *Rahmat Si Boeea 7426;* distributed by H. H. Bartlett, University of Michigan. Duplicate type in the herb. of the University of Michigan.

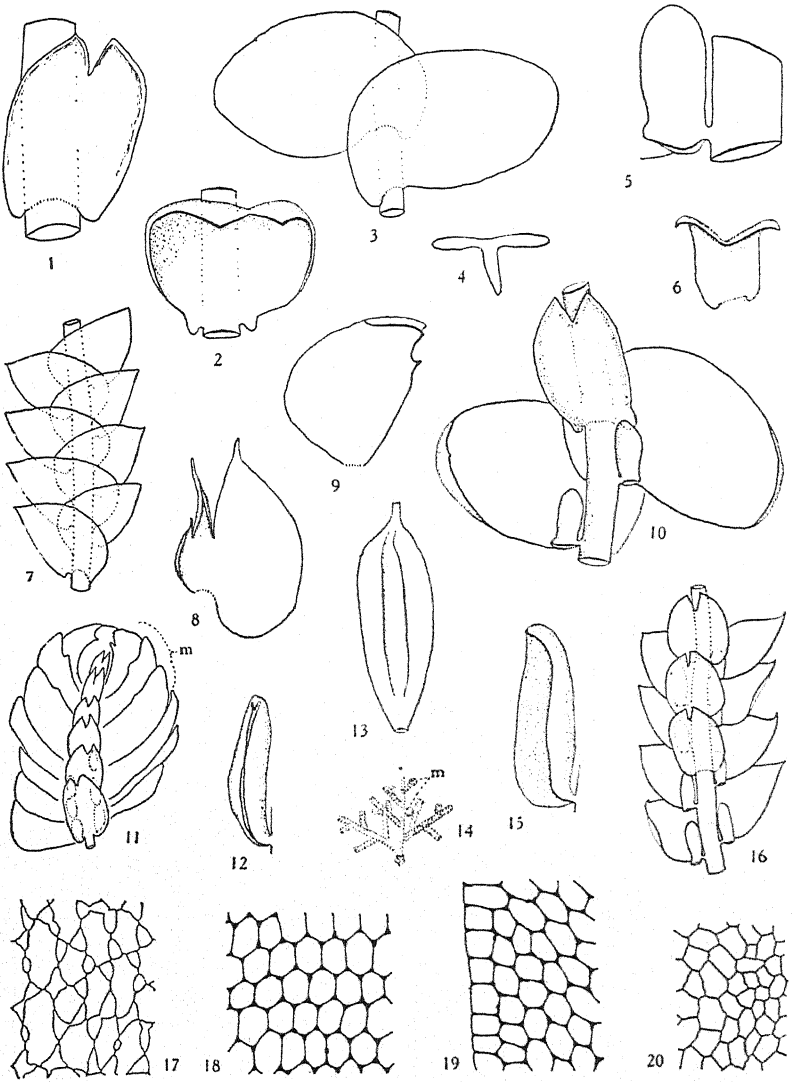
This is a very interesting species in a small, highly localized genus previously known only from the Philippines and Fiji. The larger size and acutely pointed leaves with the upper margins coarsely spinose-serrate will easily separate it from *P. philippinensis*.

FRULLANIA CUCULLATA

LOIS CLARK AND T C. FRYE

FRULLANIA CUCULLATA Lindenb. & Gottsche in G. L. & N. Syn. Hep. 782. 1847.

Plants solitary or in patches, greenish-brown to dark red. Stems up to 8 cm. long, 110–150 μ thick, regularly 1–3-pinnate; branches numerous; epidermal cells of old stems 12–20 times as long as wide. Rhizoids from abaxial surface of underleaf below its middle. Leaves imbricate. Dorsal lobe of stem leaf ovate, 475–850 μ long when measured from middle of insertion, 435–600 μ wide, strongly concave ventrally, cordate to auriculate at dorsal base, the auricle semicircular; apex of most leaves obtuse and apiculate, of some rounded, mostly bent strongly toward the ventral side; margins entire, more or less inflexed, dorsal margin arching beyond the farther edge of the stem for half to once the stem width. Saccate ventral lobe of stem leaf parallel with stem or nearly so and quite close to it, wholly saccate, oblong to oblong-obovoid, commonly somewhat constricted near mouth, 240–380 μ long, 100–180 μ wide; mouth truncate, wide, extending almost to the stem, sometimes the widest part of the ventral lobe; stalk very short. Stylus mostly wanting, rarely a single row of 2–4 cells. Explanate ventral lobes present on most plants, sometimes



FIGS. 1–20. FRULLANIA CUCULLATA

FIGS. 1–20. FRULLANIA CUCULLATA. 1. Underleaf of young stem, × 70. 2. Underleaf of old stem, × 39. 3. Part of rather young stem, dorsal view, × 39. 4. Cross section of perianth, × 17. 5. Saccate ventral lobe of leaf, × 51. 6. Female bracteole, × 14. 7. Part of rather young stem, dorsal view, × 21. 8. Female bract, × 17. 9. Male bract, ventral view, × 39. 10. Part of rather young stem, ventral view, × 39. 11. Antheridial branch. ventral view, with male (*m*) inflorescence, × 21. 12. Ventral lobe, cucullate

more numerous than the saccate ones, all explanate on branch with female inflorescence at tip, on vegetative shoots occurring without regularity on any portion of plant, lanceolate or, as rolled up, apparently narrowly lanceolate to linear, about 400 μ long; margins entire, strongly revolute, sometimes meeting but not united; apex mostly cucullate. Cells of dorsal lobe of stem leaf mostly 6-sided and almost uniformly in rows in 3 directions; cells of middle 15–30 μ, of margin 11–20 μ, of base 15–22 by 24–48 μ; walls thin; trigones rather large but not bulging except those below middle, those near base very large and nearly all bulging; intermediate thickenings scarce except near base; paracysts wanting. Gemmae not observed. Underleaves of stem contiguous to imbricate, 2-lobed, rectangular to elliptic or obovate, sometimes apparently wider than long due to the strongly revolute apical part, strongly abaxially concave, 325–650 μ long, 250–645 μ wide, distinctly auriculate at base; lobes acute to obtuse or rounded, sometimes apiculate; sinus descending one-sixth to one-fourth the length, acute to obtuse; margins entire especially toward apex. Plants unisexual. Male inflorescence terminal on a short lateral branch, with or without leaves below it, globose. Male bracts 4–8, quite saccate, 2-lobed with the halves nearly equal; halves of bracts ovate, about 515 μ long and 390 μ wide; apices bluntly acute to obtuse; margins entire except for a triangular stylar tooth above middle on ventral margin of ventral half, the tooth sometimes ending in a single row of 2–4 cells. Male bracteoles present throughout the inflorescence, free from the bracts, narrowly ovate, 2-lobed, those of the middle about 400 μ long and 190 μ wide; lobes acute; sinus descending about one-quarter the length; margins entire. Female inflorescence terminal apparently on a short lateral branch. Female bracts 2-lobed with the dorsal half very much the larger; sinus descending two-thirds to three-quarters the length. Dorsal half of female bract ovate, about 1.38 mm. long as measured from insertion and 780 μ wide; apex acuminate; margins entire, often strongly revolute toward tip, outer margin widely rounded to base. Ventral half of female bract narrowly ovate, about 1.18 mm. long as measured from insertion and 400 μ wide; apex acuminate; margins entire except for the stylar tooth, strongly revolute above so the point is usually canaliculate; stylar tooth on ventral margin, about two-fifths up from base, large, triangular, acuminate, ending in a cilium. Female bracteole free from the bracts, 2-lobed for about two-fifths its length, elliptic to oblong or obovate, depending upon the connivance or spreading of the lobes,

but not saccate, × 64. 13. Perianth, ventral view, × 11. 14. Part of plant with 2 male (*m*) inflorescences, × 1. 15. Explanate ventral lobe, × 64. 16. Part of stem, ventral view, × 21. 17. Basal cells of dorsal lobe of stem leaf, × 210. 18. Median cells of dorsal lobe of stem leaf, × 210. 19. Marginal cells of dorsal lobe of stem leaf, × 210. 20. Cells of sac of ventral lobe of leaf, × 291. (Drawn from material collected in Panama by Ruth Svihla, and in Mexico by T. C. & E. M. Frye. Plate by courtesy of the University of Washington.)

about 1 mm. long, about 400 μ wide at base of sinus; lobes acute; margins entire, strongly revolute especially of the lobes. The two underleaves immediately beneath the female bracteole with a tooth on each outer margin. Perianth one to three-quarters emergent, dorsally flattened, ovoid to narrowly obovoid, 1.6–2 mm. long, 860–910 μ wide, acute or rounded to the beak, not tuberculate; keels 0 dorsal, 2 lateral, 1 ventral, all comparatively high and thin; beak twice as long as thick; mouth with a few teeth, the marginal cells once and a half to twice as long as wide. Sporophyte not seen. On trunks of trees.

Specimens examined: MEXICO. Jacala, Estado Hidalgo (*Frye & Frye 2717*) 1939. COSTA RICA. Vara Blanca, Prov. Alajuela (*Svihla 41–485, 41–487*) 1941; San Isidoro Coronado (*Svihla 41–504*) 1941. PANAMA. Boquete, Prov. Chiriquí (*Svihla 40–402, 40–411, 40–416, 40–424, 40–438, 40–444*) 1940.

The type locality is Hacienda de Mirador, altitude 3000 feet, Mexico (Liebmann). We were unable to find this on our maps, but it is probably in the State of Vera Cruz. It has also been reported from Florida.

The strongly revolute margins of the underleaves and explanate ventral lobes attract the eye at once. This character appears also in the female bracts and bracteoles but not in the male ones. It is less pronounced in the young parts than in the old ones.

The two kinds of ventral lobes are already distinct in their young stages. So far as we are aware there is not even an hypothesis as to why a shoot gives rise to saccate ventral lobes for a while, then suddenly changes to the explanate ones for a while. The cucullate apex of many of the lobes which are not saccate seem to have suggested the name of the species.

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FRULLANIA RIOJANEIRENSIS

LOIS CLARK AND RUTH DOWELL SVIHLA

FRULLANIA RIOJANEIRENSIS (Raddi) Spruce, Trans. Proc. Bot. Soc. Edinburgh **15**: 23. 1884.

Frullanioides riojaneirensis Raddi, Mem. Soc. Sci. Ital. Modena Fis. **12**: 37. 1823; and **20**: *pl. 2, fig. 4.* 1829.
Frullania sebastinopolitana Lindenb. in G. L. & N. Syn. Hep. 412. 1845.
Frullania arietina Tayl. in G. L. & N. Syn. Hep. 413. 1845.

Plants yellowish-brown to green, more or less closely depressed to substratum, to 7 cm. long and 2 mm. wide. Branches few to many, irregularly or regularly pinnate. Stems brown, 180 to 220 μ thick; in cross section cortex layer with large, rather thick-walled, quadrate cells, 30 to 37 μ by 22 to 30 μ; interior cells of about same size with thin walls. Rhizoids brown, arising from middle of underleaves. Leaves imbricate. Dorsal lobe of stem leaf orbicular to ovate, 0.70 to 0.90 mm. long, 0.80 to 1.10 mm. wide connected to ventral half of leaf by a fold parallel to stem; apex plane or slightly decurved, broadly rounded; margin entire except where ventral half unites with it, then sinuate or bluntly toothed; dorsal margin bent towards ventral side, extending beyond the stem one-half to twice the stem width; dorsal base circinate, appendiculate. Ventral lobe of leaf approximately 290 by 365 μ; almost parallel to stem and separated from it by one-half to once the stem width; lower part plane on branches bearing inflorescences, sometimes plane throughout, sometimes irregular to somewhat oblong or rhombic, margin subentire or sinuate and bluntly dentate; upper half saccate, bent a little less than a semicircle, the distal end the smaller, with a suggestion of a proboscis, mouth truncate or nearly so. Stylus minute, subulate, a row of 1 to 6 cells, or wanting. Median cells of dorsal lobe of stem leaf averaging 25.5 by 20.5 μ; marginal cells 15 by 18 μ; trigones everywhere large, more or less bulging; walls somewhat thick; intermediate thickenings usually more numerous toward margins. Underleaves somewhat distant to imbricate, plane, mostly orbicular or broader than long; 484 to 580 μ long, 760 to 990 μ wide from point of attachment to apex; 2-lobed; sinus acute to rounded, extending about one-seventh the leaf length, lobes acute to obtuse, mostly connivent, giving the underleaf an orbicular appearance; base rounded or appendiculate; margins entire or sinuate. Plants bisexual. Male inflorescence either (1) a lateral branch, or (2) at the base of a lateral branch, or (3) at the base of a branch bearing a female inflorescence. The vegetative shoot may branch as a sterile shoot or give rise to a shoot bearing either male inflorescence or female inflorescence. Male bracts 4 to 8 pairs; bracts bilobed, lobes equal in size, obtuse; margin entire except for a tooth usually present on the ventral margin. Male bracteole apparently present throughout, triangular to oblong, bilobed; lobes unequal in length. Female inflorescence terminal on lateral branch; female bracts 2-lobed; dorsal lobe slightly larger; sinus extending about one-half the length of bract. Dorsal half elliptical to ovate; 1.20 to 1.60 mm. long, 0.87 to 1.02 mm. wide; apex acute or rounded; margin entire or sinuate or with a few blunt teeth. Ventral half narrowly ovate, acute to acuminate, averaging 1.18 by 0.67 mm., sparingly and irregularly toothed, having a distinct larger tooth (stylus) at the middle or below on its inner edge. Female bracteole connate with both bracts for one-half to three-fifths its length, averaging 1.17 by 0.65 mm., unequally lobed; sinus obtuse to rounded; lobes acute to acuminate; margins entire.

Perianth one-half or less emergent, 1.80 by 0.80 mm., oblong ovoid, or fusiform, abruptly narrowed to a short broad beak with inner cells papillate; in cross section trapizoidal; two deep lateral keels and two less deep ventral ones. Sporophyte extending somewhat beyond the perianth. Seta about twice the length of the mature valves, the many rows of cells arranged end to end with random cross-walls. Outer and inner layers of capsule wall with knob-like thickenings at the corners. Elaters brown, unispiral, 255 to 306 μ long, 8 to 22 μ in diameter at middle point. Spores light brown.

Reported from the Bahamas, Florida, Mexico, British Honduras, West Indies (Puerto Rico specifically), Trinidad, Brazil, Peru, Galapagos Islands, and Chile.

SPECIMENS EXAMINED: UNITED STATES; Florida, Dade Co., Miami, Brickell Hammock (*J. K. Small 5273*) 1915; on shrubs, Timm's Hammock (*A. J. Grout*) Feb. 24, 1940; Collier Co., in Big Cypress Swamp, west of Deep Lake (*A. J. Grout and J. B. McFarlin 995, 1059*) Apr. 15, 1934. PUERTO RICO: Cayey, on rocks (*A. W. Evans 91*) 1900; Mt. Morales near Utuado (*M. A. Howe 484, 814, 1096; E. G. Britton and D. W. Marble 837*) 1906; Mayagüez, Las Marias Road (*E. G. Britton and D. W. Marble 591*) 1906; Peñuelas, Bo. Rucio, Isleta Cave, on living trees (F. M. Pagán 465) 1937. MEXICO: Estado Hidalgo, Jacala, about 16 kilometers southward along highway, on trunks of trees, altitude about 2600 meters (*T. C. and E. M. Frye 2697* with *F. squarrosa* and *F. inflata*) May 2, 1939; Estado San Luis Potosí, Tamuzunchale, about 4 kilometers eastward up river, on bark of tree, altitude about 170 meters (*T. C. and E. M. Frye 2860*) May 25, 1939; Las Palmas, easternmost Chiapas (*C. D. LaRue*) Feb. 8, 1941. GUATEMALA; District of Petén, La Libertad (*C. L. Lundell 2244*) Mar. 20, 1933; Sabana San Francisco, La Libertad (*C. L. Lundell 2242a*) Mar. 30, 1933. COSTA RICA: Río Torres, on bank of river between San José and Heredia, on soil (*R. D. Svihla 41453, 41454*) July 5, 1941. PANAMA: Chiriquí Province, Boquete, on trees (*R. D. Svihla 40436, 40443*) Sept. 3, 1940.

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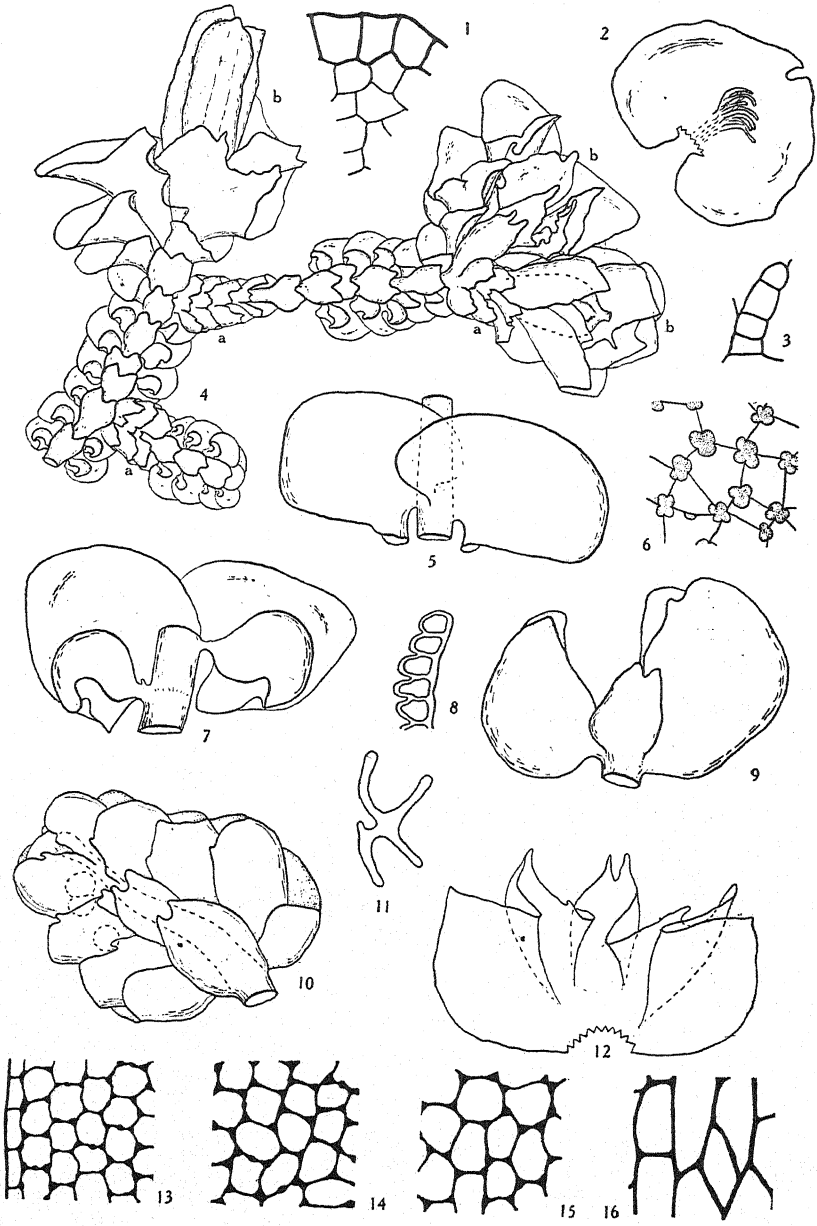
FIGS. 1–16. FRULLANIA RIOJANEIRENSIS. 1. Cross-section through stem, × 223. 2. Underleaf showing attachment of rhizoids, × 28. 3. Stylus, × 223. 4. Ventral view of plant showing (a) male inflorescences and (b) female inflorescences, × 12. 5. Dorsal view of plant, × 28. 6. Cells of the sporophyte, × 223. 7. Ventral view of plant, × 28. 8. Profile of inner cells of perianth tip, × 223. 9. Male bracts and bracteole. × 51. 10. Male inflorescence, × 28. 11. Cross-section through perianth, × 28. 12. Female bracteole with connate bracts, × 15. 13. Marginal leaf cells, × 223. 14. Median leaf cells, × 223. 15. Basal leaf cells, × 223. 16. Surface view of stem cells, × 223. (Plate by courtesy of the University of Washington.)



FIGS. 1–16. FRULLANIA RIOJANEIRENSIS

A REVISION OF THE NORTH AMERICAN SPECIES OF STEREOPHYLLUM AND PILOSIUM, WITH DESCRIPTIONS OF SOME SOUTH AMERICAN SPECIES

A. J. GROUT

STEREOPHYLLUM Mitt., Musc. Ind. Or. 117. 1859.

Plants slender to rather robust; stems creeping, with more or less numerous rhizoids on the underside, irregularly branching in most species; usually complanate-foliate, leaves ovate- to oblong-lingulate, ovate-lanceolate, oblong or elliptic, acute or obtuse, mostly plane-margined, entire or serrulate above, the lateral leaves asymmetric with the narrower margin often somewhat incurved; costa extending to the middle of the leaf or beyond; leaf cells rhombic (subgenus (*Eustereophyllum*) to linear (subgenus *Moneurium*), smooth to papillose; quadrate alar cells numerous; capsules suberect to curved and cernuous, often contracted below the mouth when dry and empty, ovoid to subcylindric; calyptra cucullate, smooth; operculum conic to short rostrate; peristome perfect, hypnaceous, the inner from a basal membrane with cilia often present, segments linear-lanceolate, entire or split between articulations.

In this preliminary study of the Stereophylloideae (in the sense of Brotherus), I have included such information on South American species as has been readily available.

KEY TO THE SPECIES OF STEREOPHYLLUM

Median leaf-cells rounded-rhombic (*Eustereophyllum*) . . . . . 1. *S. radiculosum*
Median leaf-cells narrowly linear to rhombic-linear (*Moneurium*)
  Leaves serrulate in the upper third or half
    Leaves broadly to narrowly acute, serrulate in upper third or less . . . . . 6. *S. rhabdodonta*
    Leaves broadly acute to obtuse, serrulate in upper third or more . . . . . 2. *S. cultelliforme*
  Leaves entire or with an occasional tooth at apex of some leaves
    Leaves lingulate, broadly to narrowly obtuse . . . . . 3. *S. subobtusum* (and *S. obtusum**)
    Leaves sharply acute to slenderly acuminate
      Capsules more or less curved and asymmetric . . . . . 5. *S. leucostegum*
      Capsules erect and symmetric or nearly so
        Leaves filiform-acuminate with long-linear apical cells . . *S. seminerve**
        Leaves variously acute, but apical cells not especially elongate
          Many leaves slenderly acuminate . . . . . 4. *S. mexicanum*
          Leaves acute
            Leaves crowded, overlapping when moist . . . . . *S. papilliferum**
            Leaves distant, widely-spreading when moist 7. *S. contorte-operculatum*

* Not North American.

Subgenus EUSTEREOPHYLLUM

1. STEREOPHYLLUM RADICULOSUM (Hook.) Mitt., Journ. Linn. Soc., Bot. 12: 542. 1869.

**Hookeria radiculosa* Hook., Musci Exot. *pl. 51.* 1818.
**Omalia? Wrightii* Sull., Mosess U. S. 65. 1858.
**Hypnum Wrightii* Sull., Ic. Musc. 209. *pl. 127.* 1864.
Stereophyllum cubense* Mitt., Journ. Linn. Soc., Bot. **12: 544. 1869.
S. paraguense* Besch., Mem. Soc. Nat. Sci. nat. Cherb. **21: 268. 1877. (*Balansa 1196*).
S. guarapense Besch., *Ibid.* **21**: 269. 1877.
Hypnum turgidicaule* C. Müll., Rev. Bryol. **14: 57. 1887 (*nomen nudum*).
Stereophyllum jamaicense* C. Müll., Bull. Herb. Boiss. **5: 565. 1897.
S. affixum C. Müll., Ibid. **5**: 217. 1897 (probably).
S. affine* Ren. & Card., Bull. Soc. Roy. Bot. Belg. **41: 146. 1903.
S. turgidulum* Card., Rev. Bryol. **37: 13. 1910.

Plants in loose patches or mats, mostly light to yellowish green; stems 1–2 cm. long, prostrate, radiculose ventrally, sparingly branched or divided, complanately foliate; dorsal leaves symmetric, oblong-lingulate to oblong-ovate, 1.5–2.0 × 0.6–0.9 mm., rounded-obtuse to broadly acute, entire to finely serrulate near the apex; costa stout below, extending at least two-thirds the length of the leaf; median leaf cells rhombic to oblong-rhombic, about 8 × 20–30 μ, slightly mamillose to strongly unipapillate, lower leaves less papillose than the upper, juxtacostal cells longer and narrower in the lower half, subquadrate and transversely elongate, quadrate alar cells numerous, 20–30 on the margin, rather obscure, extending to the costa at the leaf base; lateral leaves asymmetric, narrower on the upper side with fewer quadrate alar cells and more elongate juxtacostal cells in the lower portion; subcircular paraphyllia occasional; perichaetial leaves subclasping, lanceolate and acuminate; monoicous; seta slender, about 1 cm. long, light brown, becoming reddish with age; capsules light brown, oblong-cylindric, suberect and nearly symmetric to obovoid and inclined, unsymmetric and subcernuous, 1.5–2.0 × 0.4–0.8 mm., operculum included; operculum long-conic to rostrate, up to 0.8 mm.; annulus lacking; peristome teeth marked with transverse lines below, papillose above; inner peristome from a rather wide basal membrane; cilia rudimentary to well developed, single; spores up to 15 μ, finely papillose.

TYPE LOCALITY: Caripe, Venezuela (*Humboldt & Bonpland*).

DISTRIBUTION: On wood, less frequently on rocks; Florida, Texas, New Mexico; Mexico; Central America; West Indies; South America to Paraguay.

ILLUSTRATIONS: Hooker, Musci Exot. *pl. 51;* Sull., Ic. Musc. *pl. 127.*

EXSICCATI: Sull. & Lesq., Musci Bor. Am. 269, ed. II, 356; Aust., Musci App. Suppl. 544; Grout, N. Am. Musci Pleur. Suppl. 7, N. Am. Musci Perf. 210 (all as *S. Wrightii*); Pringle, Plantae Mex. 770, 10665, 15236 (as *S. turgidulum*); Millspaugh, Plantae Utowanae 1523.

Isotypes of the species marked have been seen. *S. radiculosulum* (C. Müll.) Jaeg. (Adumb. **2**: 541. 1877–78) is probably also another synonym. An isotype of *S. cubense* has the leaf cells more elongate than in the great majority of specimens referred to this species. The capsules as figured by Hooker and by Sullivant seem quite different, and the capsules of the isotypes look as different as the figures. No corresponding differences in the gametophyte seem to be coördinated with these differences. The age and condition of the specimens seem to account for the differences to quite an extent. Measurements show that the capsules run about the same length and that the differences are largely in the thickness and the asymmetry. In the dozens of plants examined there were all gradations between these capsule forms. The difference in the appearance of the opercula is also largely due to age and condition. The presence or absence of cilia in the endostome seems to be variable and not correlated with capsule differences. However, it has not been possible to check this character as thoroughly as is desirable, as few specimens have capsules in perfect condition and it was not deemed desirable to dissect many capsules of isotypes. Mrs. Britton and Mr. Bartram have also agreed to the synonymy of *S. radiculosum* and *S. Wrightii.*

Subgenus **Moneurium** (Section *Moneurium* C. Müll., Bull. Herb. Boiss. **5**: 217. 1897).

2. STEREOPHYLLUM CULTELLIFORME (Sull.) Mitt., Journ. Linn. Soc., Bot. **12**: 544. 1869.

Hypnum cultelliforme Sull., Proc. Am. Acad. Arts & Sci. **5**: 289. 1861.

Stereophyllum Howei Williams, Bull. Torr. Club **38**: 35. 1911.

S. Matoubae Besch., Journ. de Bot. **16**: 10. 1902.

Plants in thin mats with creeping, somewhat branching stems 1 cm. or more in length; stem leaves up to 1.5 mm. long, 0.4–0.5 mm. broad, complanate and loosely erect-spreading, oblong-lanceolate to oblong-ovate or lingulate, acute to obtuse and slightly apiculate, inequilateral and often somewhat cultriform (whence the name), incurved at base on the narrower upper margin, smooth on both sides, sharply serrate along half or more of the upper margin, sometimes nearly to the base;

costa extending somewhat above the middle of the leaf; median leaf cells mostly narrowly linear-flexuose, 4–5 × 40–80 μ, the apical shorter; quadrate alar cells numerous, up to 20 or more on the margin, many fewer to almost lacking on the narrower margin of lateral leaves, rather dense; branch leaves often smaller, relatively narrower and more strongly serrulate; perichaetial leaves narrowly lanceolate and slenderly acute, faintly costate in the basal half, serrulate; autoicous; antheridial buds near the archegonial; perigonial leaves ovate, small, serrulate, inclosing 4–5 antheridia without paraphyses; seta erect, 7–12 mm. long; capsule oblong to ovoid, inclined, urn 1.0–1.5 mm. long, contracted under the mouth when dry and empty; operculum conic-rostrate, about half the length of urn; annulus lacking; outer teeth of peristome with highly projecting lamellae on the inner side above the middle, transversely striate below, papillose above; inner peristome a little shorter, papillose above, segments lanceolate, carinate, not split, cilia single or rudimentary; spores smooth, up to 16 μ in diameter.

TYPE LOCALITY: Cuba (*Wright 126*).

DISTRIBUTION: On rocks in shaded ravines; Panama to Peru; most of the West Indian Islands.

EXSICCATI: Wright, Cuban Mosses 126.

The type of *S. Howei* is a form with sublingulate, obtuse leaves and well-developed cilia. There are all kinds of intergradations between this and Wright's 126. Mitten declared the inflorescence to be monoicous; Brotherus lists it as dioicous; Mrs. Britton found both conditions in specimens at the New York Botanical Garden. The type of *S. Howei* is autoicous.

3. STEREOPHYLLUM SUBOBTUSUM Ren. & Card., Bull. Soc. Bot. Belg. **41**: 147. 1903.

Plants bright green, in rather thin mats; stems creeping, radiculose, loosely complanate-foliate, irregularly branching, 2–5 cm. long; leaves somewhat downward curved, 1–1.5 mm. long, oblong-cultriform to lingulate, broadly to narrowly obtuse, entire or slightly crenulate at the very apex only, the lateral asymmetric at base, ventral side narrower, incurved; costa thin, reaching rather above the leaf middle; median cells linear, 50–70 × 5–7 μ, shorter at apex; quadrate alar cells up to 16 on the wider upper margin, extending to the costa, rather dense and small, the basal marginal rectangular, 2–3 : 1; few to almost lacking on the narrower lower margin, all nearly or quite smooth; perichaetial leaves erect and subclasping, the inner long subulate-acuminate, up to 2 mm. long, often faintly serrulate at base of acumination, with costa faint or lacking; monoicous; seta up to 15 mm. long, smooth; (operculum fallen), urn cylindric-arcuate, about 2 mm. long, contracted below the mouth when dry and empty; peristome teeth

slender, papillose above, marked with fine transverse lines below; segments of inner peristome from a low basal membrane, narrowly linear-lanceolate, somewhat shorter than the teeth, more or less open between joints, papillose above, no cilia present but peristomes were old and broken.

TYPE LOCALITY: La Verbena, near Alajuelita, Costa Rica (*Pittier 5802*). Isotype in the National Museum examined.

Distinguished from broad-leaved forms of *S. cultelliforme* by the almost entire leaves and fewer quadrate alar cells, and by the very different capsule which resembles that of *Amblystegium*. This longer arcuate capsule also seems the most conspicuous difference from the Brazilian *S. obtusum* Mitt., the longest urn observed on the type of *S. obtusum* was 1.6 mm. long and most were shorter than this. The authors of *S. subotusum* say that the leaf cells are longer and narrower than *S. obtusum*. This I have not been able to demonstrate.

4. STEREOPHYLLUM MEXICANUM Williams, THE BRYOLOGIST, **26**: 34. 1923.

Plants in depressed olive-green mats; stems somewhat complanate-foliate and irregularly branching; leaves ovate-lanceolate about 2 mm. long, the lateral unsymmetric with the upper narrower side somewhat incurved, gradually and slenderly acuminate, minutely serrulate above, entirely smooth; costa extending about ½ the length of the leaf; leaf cells linear, 6–8 × 60–80 μ, quadrate alar cells numerous extending to the costa and up to 20 or more along the margin of lateral leaves, fewer on the narrow side; perichaetial leaves rather shorter, narrower, more distinctly serrulate; autoicous; seta about 8 mm. long; capsule erect and symmetric, oblong-cylindric, urn between 1.5 and 2 mm. long; operculum long-rostrate, about half the length of urn; annulus lacking; peristome about 0.2 mm. high, the teeth transversely striate below, papillose above; inner peristome nearly as high, pale, delicate, from a basal membrane about one-fourth its height, segments slightly papillose above, lanceolate, split between the joints along the keel; cilia lacking; spores up to 24 μ, somewhat rough.

TYPE LOCALITY: Near Guadalajara, Mexico (*Pringle 705, 707*).

Although Williams refers this to the section *Juratzkaea* (Lor.) Broth., the unsymmetric lateral leaves and general sturcture place it clearly in section *Moneurium* (C. Müll.) Fleisch. The development of cilia in the peristome seems quite variable even in the same species of this genus.

The leaves of this species match those of *S. peruvianum* (Mont.) Mitt. but the capsules of the latter as described are very different, being ovoid, unsymmetric with a conic-acuminate operculum (*Hypnum peruvianum* Mont. Voy. Bonite, Crypt. 305. 1844–46. *pl. 150*).

5. STEREOPHYLLUM LEUCOSTEGUM (Brid.) Mitt., Journ. Linn. Soc., Bot. **12**: 543. 1869.

Leskea leucostega Brid., Bryol. Univ. **2**: 333. 1827.
Hypnum flavonitens C. Müll., Bot. Zeit. **2**: 742. 1844. (*nomen nudum*) (fide Paris).
H. Gardneri C. Müll., *Ibid.* **2**: 742. 1844. (*nomen nudum*) (fide Paris).
H. saxatile Hook. & Wils., Lond. Journ. Bot. **3**: 164. 1844. (fide Mitten).
H. subflavum Hook. & Wils., *Ibid.* **3**: 164. 1844. (fide Mitten).
H. (Brachythecium) Donnellii* Aust., Bot. Gaz. **4: 162. 1879.
Stereophyllum pycnoblastum C. Müll., Bull. Herb. Boiss. **5**: 217. 1897 (probably).
S. leucothallium C. Müll., Hedwigia **37**: 261. 1898 (fide Mitten and Mrs. Britton in notes at New York Botanical Garden).
S. perpusillum* C. Müll., Field Mus. Publ. Bot. **1: 348. 1898.
***S. Orcuttii* Card., Rev. Bryol. **40**: 39. 1913.

Plants small, in thin mats; stems slender with short, irregularly placed branches; cortical cells rectangular, up to 17 μ wide; stem leaves rather close together, loosely imbricate when moist, somewhat complanate, up to 1.5 mm. long, broadly to narrowly ovate-lanceolate, gradually and slenderly acuminate, mostly entire, entirely smooth; lateral leaves asymmetric with margins incurved at base; costa reaching about to leaf middle, attenuate; quadrate alar cells numerous especially on the broader lower side of the lateral leaves where they may number more than 30 on the margin and extend in to the costa; median cells linear-fusiform, 6–10 μ wide, 4–7 : 1, basal shorter; perichaetial leaves smaller, similar, sometimes ecostate; monoicous; seta slender, about 1 cm. long; capsule small, urn less than 1 mm. long, ovoid, inclined, with exothecial cells irregularly hexagono-rectangular, collenchymatous; operculum conic to short-rostrate; peristome teeth with fine transverse lines at base, papillose above; inner peristome shorter, papillose, cilia single and usually well developed; spores about 15 μ in diameter, smooth.

TYPE LOCALITY: Puerto Rico.

DISTRIBUTION: On tree bases, wood and soil; Florida; Mexico; West Indies; Central and South America.

ILLUSTRATION: Grout, Moss Fl. N. Amer. *pl. 42E.*

EXSICCATI: Grout, N. Am. Musci Pleur. Suppl. 37; Wright, Cuban Mosses 114; Pittier & Durand, Plantae Costa Ric. 5801.

Mrs. Britton, in notes at the New York Botanical Garden, cites *Hypnum viridulum* Brid. (Sp. Mus. **2**: 181. 1812) and *Hypnum* (*Stereodon*) *ruderale* Brid. (Bryol. Univ. **2**: 585. 1827) as synonyms.

* Isotype seen; ** Type seen.

No further confirmation is at hand. The operculum of an isotype of *Hypnum Donnellii* and further collections from the same locality have a conic operculum. The Andean plants have a somewhat longer operculum and leaf cells 2–3 μ narrower, on the average. A form from Panama identified by Williams (*Brother Paul 214*) is stouter, darker green, with ovate leaves acute to short-acuminate and costa extending beyond the middle. A specimen in the Mitten herbarium at the New York Botanical Garden from Rio de Janeiro (*Glaziou 7423*), labelled *Hypnum leptostegum* Hampe in Mitten's handwriting, is this species and presumably indicates another synonym. The type of *S. Orcuttii* matches Brother Paul's 214 very closely. It differs chiefly in having a few of the leaves with slightly reflexed margins.

STEREOPHYLLUM PAPILLIFERUM Mitt., Jour. Linn. Soc. **12**: 544. 1869.

Plants in loose, spreading mats over tree trunks, bright green; leaves loosely appressed, oblong-ovate, gradually acute to short-acuminate, concave, entire to slightly serrulate near apex by projecting cell angles, up to 1.6 mm. long and nearly half as wide, margins plane; costa strong, extending to the leaf middle or beyond; upper leaf cells linear-rhombic, about 7 × 35–50 μ, shorter and broader below; quadrate alar cells numerous, up to 30 on the margins and extending to the costa; lateral leaves asymmetric with fewer quadrate alar cells on the narrower upper side; perichaetial leaves subclasping, abruptly subulate-acuminate from an oblong-lanceolate base entire or toothed on the subula, angular cells rectangular; capsules light brown, smooth, oblong-cylindric, nearly erect and symmetric, urn including the short neck up to 1.6 mm. long; operculum shortly conic-apiculate; peristome teeth with transverse lines on lower outer plates, papillose on the upper half; segments linear-lanceolate, nearly as long as the teeth, papillose even to the narrow basal membrane, narrowly open between joints, cilia apparently lacking; spores finely papillose, up to 16 μ, mature in September.

TYPE LOCALITY: Guayaquil, Ecuador (*Spruce 1317*).

DISTRIBUTION: On tree trunks, near Yarauna, Venezuela, alt. 400–500 m. (*Pittier 11141, 11142*), in U. S. National Museum. Isotype seen.

No papillae were found on the isotype, Spruce's 1317, at the New York Botanical Garden.

STEREOPHYLLUM SEMINERVE (Kunze) Mitt., Jour. Linn. Soc. **12**: 542. 1869 from Chili, a species very closely allied to *S. mexicanum* but with leaves with a slender filiform acumination, has been placed

by Brotherus (E. & P. ed. 2, **11**: 290) in the genus *Juratzkaea*, and in the Fabroniaceae, evidently following Fleischer.

Both these species have asymmetrical lateral leaves with more numerous quadrate alar cells on the wider side next the substratum, a striking characteristic of *Stereophyllum* and its allied genera.

Both differ from the subgenus *Moneurium* (C. Müll.) Grout (Section *Moneurium* C. Müll., Bull. Herb. Boiss. **5**: 217. 1897) chiefly in the erect symmetric capsule and lack of cilia in the inner peristome.

The characters of taxonomic import between *S. leucostegum* and *S. seminerve* are far less than those between *S. leucostegum* and *S. radiculosum*. The microscopic characters between the gametophyte of *S. leucostegum* and *S. seminerve* are so slight one could easily be mistaken for the other unless one were familiar with both. In a group where the symmetry of the capsule and the development of endostome cilia are so variable, these characters do not evaluate to a generic difference, much less a family distinction.

Brotherus's statement (*l. c.* 397) that the lateral leaves of *S. radiculosum* are symmetric or nearly so is a gross error.

6. STEROPHYLLUM **rhabdodonta** (Card.) comb. nov.

Entodontopsis rhabdodonta Card, Rev. Bryol. **37**: 12. 1910.

Plants in rather thin dark green mats over stones; stems slender, short; somewhat branched, complanate foliate, cortical cells narrow; leaves rather distant, spreading at about a 60° angle when moist; the dorsal broadly lanceolate, symmetric, with few short rectangular basal and alar cells; lateral oblong- to ovate-lanceolate, about 1.6 mm. long and varying in width, with a strongly unsymmetric considerable area of clear quadrate to short-rectangular angular cells on the broader lower side and reaching to the costa, few on the narrower upper basal side; all leaves broadly to narrowly acute and mostly finely serrulate near apex, somewhat concave with plane margins; costa extending nearly or quite to the middle of the leaf, attenuate; median leaf cells linear-rhombic, about 7 × 50–65 μ; inner perichaetial leaves subclasping, subulate-acuminate, serrulate; monoicous; seta slender, up to 15 mm. long; capsule erect and symmetric or nearly so, urn up to 2 mm. or more in length; operculum conic-rostrate, more or less oblique, 0.4 mm. long; annulus none; peristome teeth with fine transverse line in the lower half, papillose above; segments of endostome as long as the teeth, narrowly linear from a narrow basal membrane, papillose; spores about 10 μ in diameter, smooth, maturing Sept.–Oct.

TYPE LOCALITY: Etzatlan, State of Jalisco, Mexico (*Pringle 15221*). Also collected in the same locality by Barnes and Land (*262*).

Described from an isotype (Pringle, Plantae Mex. 15221) at the New York Botanical Garden.

7. STEREOPHYLLUM CONTORTE-OPERCULATUM (C. Müll.) Mitt., Jour. Linn. Soc. **12**: 543. 1869.

Hypnum contorte-operculatum C. Müll., Syn. **2**: 682. 1851.
Entodontopsis contorte-operculata Broth., E.-P. **1**[3]: 896. 1909.

No authentic specimens have been available but from the original description and Brotherus illustrations (l. c. *f. 657*) it appears to differ from *S. rhabdodonta* in the entire leaves, shorter and broader segments of the endostome and (according to Cardot) the peristome teeth less transversely lined in the lower portion.

TYPE LOCALITY: Costa Rica (*Oersted*).

In his descriptive definition of *Entodontopsis* Brotherus fails to mention the decidedly asymmetric lateral leaves. He does mention the narrow cortical stem cells that differ markedly from some others of the *Moneurium* section of *Stereophyllum*.

PILOSIUM C. Müll., Flora **83**: 339. 1897.

Rather large plants for the family in wide thin somewhat glossy mats chiefly on decaying wood; stems creeping with numerous ventral rhizoids, irregularly branching, closely and complanately branching; dorsal leaves symmetric, oblong-ovate, ecostate; lateral similar but asymmetric, the lower edge with more numerous differentiated alar cells, all concave with plane margins, all cells except the near basal liner, often flexuose; autoicous; sporophyte as in *Stereophyllum*. Type species: *P. chlorophyllum*.

KEY TO SPECIES OF PILOSIUM

Leaves entire or nearly so.....1. *P. chlorophyllum*
Leaves serrulate near apex.....2. *P. serrulatum*

1. PILOSIUM CHLOROPHYLLUM (Hornsch.) C. Müll. Flora, **33**: 340. 1897.

*?*Hypnum chlorophyllum* Hornsch., Fl. Brasil, **1**[2]: 89. 1840.
Stereophyllym chlorophyllum (Hornsch.) Mitt., Jour. Linn. Soc. **12**: 544. 1869.
Pilosium flaccisetum C. Müll., Flora **83**: 339. 1897 (probably).
Pilosium Crügerianum* C. Müll., Flora **83: 340. 1897.
Pilosium pseudoradiculosum C. Müll., Flora, **83**: 340. 1897. (*nomen nudum*).
Pilosium subchlorophyllum C. Müll., Flora **83**: 340. 1897. (*nomen nudum*).
Pilosium longisetulum C. Müll., Flora **83**: 340. 1897. (*nomen nudum*).

* Isotype seen

Leaves strongly complanate, the dorsal up to 2 × 0.8 mm. oblong-ovate, obtuse to broadly acute, much narrower at the insertion, concave, margins plane and entire or rarely an occasional cell angle projecting near apex; costa lacking or nearly so; median cells linear-flexuose, 6–7 μ wide, across the base at the insertion a row of short, rectangular, thick walled, somewhat porose cells; quadrate alar cells few or lacking; lateral leaves often somewhat cultriform, asymmetric, the lower side wider with numerous large clear rectangular alar cells; inner perichaetial leaves subulate-acuminate; monoicous; seta slender, 1 cm. or more long; capsule obovoid, subhorizontal to drooping, urn about 1.5 mm. long, contracted under the mouth when dry and empty; operculum conic-rostrate; peristome teeth with transverse lines below, papillose above; inner peristome from a rather wide basal membrane, segments as long as the teeth, split along the keel, ending in a slender filament, papillose, cilia single.

TYPE LOCALITY: Brazil, near Pará.

DISTRIBUTION: Guatemala, Costa Rica, Panama Canal Zone; South America; West Indies.

There is a wide variation in the shape of the leaf apex, from obtuse in the form named as *P. longisetulum* to acute in typical *P. chlorophyllum*. The form named *subchlorophyllum* seems to have obtuse leaves with a short triangular apiculus. Occasional small serrations near the apex are not rare on some leaves.

The superficial resemblance to *Plagiothecium denticulatum* (Hedw.) Bry. Eur. is striking, but the capsules, about half the length of that species.

2. PILOSIUM SERRULATUM Williams, Jour. Wash. Acad. Sci. **20**: 178. 1930.

Plants in loose, glossy green mats; stems up to 4 cm. long, with few radicles, irregularly branched, strongly complanate-foliate; leaves oblong-ovate, acute, ecostate, minutely serrulate near apex about 1.5 × 0.65 mm., the dorsal symmetric with few differentiated alar cells but usually with a narrow area of broader shorter basal cells; median leaf cells 4–5 μ wide, up to 100 μ long; lateral leaves asymmetric with few quadrate or rectangular alar cells on the upper narrower side and a considerable number on the lower side, somewhat inflated and hyaline or colored, 20–25 μ wide; autoicous, antheridial buds with about 4 large antheridia reaching 0.35 mm. long, enclosed by rather broadly lanceolate leaves minutely serrulate at apex; outer perichaetial leaves short, the inner twice as long with a narrowly lanceolate, serrulate apex from an oblong-ovate base; sporophyte unknown.

TYPE LOCALITY: Haiti, near St. Michel de l'Atalaye (*Leonard 7248*).

ILLUSTRATION: Williams, l. c. *fig. B* (p. 79).

Doubtfully more than a variety of *P. chlorophyllum* with more distinctly serrulate leaves, narrower median leaf cells and more numerous enlarged basal cells.

THE ATRACHEATA (BRYOPHYTA) OF IOWA

I. THE SPECIES AND THEIR GEOGRAPHIC DISTRIBUTION IN THE STATE

HENRY S. CONARD

Through the kindness of the Botany Staff of the State University of Iowa I have had the privilege of examining the large collection of mosses and liverworts brought together by the late Professor Bohumil Shimek and his associates. Most of the collections are by Shimek himself, but many of the earliest were taken by T. E. Savage. Later Miss Lucy M. Cavanagh made some notable contributions. The skill and thoroughness and minute discrimination of these botanists are not excelled by any bryologist. Savage was the first to pick up *Bruchia Sullivanti;* it was not seen again for more than thirty years. Shimek obtained a clump of *Saelania glaucescens* in Clayton County, and an ample supply of *Aloina rigida* at Council Bluffs. Miss Cavanagh scraped *Gyroweisia* (*Gymnostomum*) *tenuis* from a rock in Dubuque County, one of the only three known American collections of the species.

In Emmet County, B. O. Wolden has made a number of remarkable finds. He has kindly placed his collection at my service. Miss A. E. (Betty) Blagg (Mrs. E. H. Anderson) discovered several rarities in Fayette and Henry Counties, and R. V. Drexler has made excellent finds in Linn County. D. L. Savage added *Dicranum rugosum* to the list in 1944. The writer has collected in every county in the State except two, adding some unique species and extending our knowledge of distribution.

An estimated three thousand packets from Iowa have been examined in the author's collections, involving at least five thousand determinations of species. Some hundreds of packets from Iowa Wesleyan College, Iowa State College, from B. O. Wolden and from D. L. Savage have been examined and noted.

The University collection consists of over 5000 packets. The examination of these involved over 10,000 determinations of species.

This work was started in 1939 and brought to a close in January 1945. The last four months of this undertaking was partly financed by the Graduate Department of the State University of Iowa. This aid is herewith gratefully acknowledged. Practically all of the work was done in the Botany Laboratory of Grinnell College. As Emeritus Professor since June 1944 I am especially indebted to Grinnell College for the facilities of the Laboratory.

During nearly twenty years I have freely asked for aid in the identification of specimens, and have abundantly received it, from the well-known bryologists Ammons, Bartram, Blomquist, Drexler, Flowers, Frye, Fulford, Grout, Sharp, Steere, True, Wareham and Welch, members of the Sullivant Moss Society. Warm thanks to all of these!

Three distributions of Atracheata of Iowa have been sent to ten interested herbaria, being a total of 135 mosses and 30 liverworts. Not many other species will ever be found in the State in sufficient quantity to distribute. The following list is entirely based on specimens seen by the author. This is not the place to explain the omission of many names published by various authors. There are synonyms, mis-identifications and missing specimens involved. The only reported species on which we have no information beyond the printed page, and no opinion, is *Amphidium californicum*. We have been unable to discover specimens of this. So far as we know everything else is accounted for. The segregation of varieties and forms has not been consistently carried out. Perhaps they should not have been mentioned at all.

In the following alphabetical list the herbarium specimens are indicated by letters:

a, specimens in one of the distributions

b, specimens in the author's collection at Grinnell College

c, specimens in the herbarium of the State University of Iowa

The counties of the State are designated by numbers according to the accompanying map, Fig. 1, for which I am indebted to Professor H. E. Jaques of Iowa Wesleyan College. The expression 2–4 means that the species has been found in counties 2, 3 and 4.

Though we here record the occurrence of mosses by counties, "we recognize the inadequacy of the use of political areas for describing the distribution of plants. The county unit is used solely for convenience. When the plant associations of the State have been identified, described, and located, the distribution of all plants, and animals as well, can be adequately stated" (Conard 1942).

The absence of many species from many counties is obviously due to inadequate collecting. This list should be useful in pointing out what to look for quite as much as for recording our present knowledge of the distribution of the species in the State. We will welcome every opportunity to see specimens we have failed to record, and to see any material not already on record for the county. All other corrections will be gratefully received.

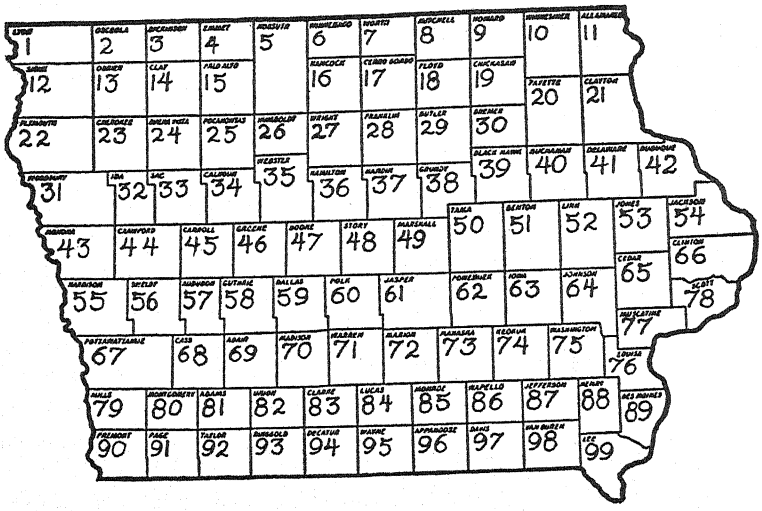


FIG. 1. Map of Iowa with counties numbered.

The names used are those given in the latest Check Lists of the Sullivant Moss Society (THE BRYOLOGIST **43**: 117–138. 1940).

THE LIST*

MUSCI

ACAULON RUBRUM b 62
ACAULON RUFESCENS b 52
ACAULON SCHIMPERIANUM b 31 (W. R. Mills)
ACAULON TRIQUETRUM b 62
ALOINA RIGIDA c 31, 67
AMBLYSTEGIELLA CONFERVOIDES bc 8, 10, 11, 20, 21, 41, 42, 47, 50, 53, 98
AMBLYSTEGIUM AMERICANUM bc 1, 21
AMBLYSTEGIUM COMPACTUM bc 20, 21, 41, 42, 53

* For Pleistocene fossil species see Part 3, Grout 1917; Macbride 1896; Savage 1903, 1905; Steere 1941; Wynne 1944. Steere covers all of them.

AMBLYSTEGIUM JURATZKANUM bc 2–4, 6–8, 10, 11, 13, 14, 17, 20, 21, 23, 26, 27, 29–31, 34, 37, 38, 42, 47, 52, 53, 54, 58, 62, 63, 70, 73–75, 77, 80, 85, 86, 94–96, 99

AMBLYSTEGIUM SERPENS bc 3, 4, 7, 11, 14, 20–22, 25, 29, 31, 37, 42, 50, 52, 54, 59, 64, 73, 77, 79, 88, 97

AMBLYSTEGIUM SERPENS var. TENUE c 4, 11, 42

AMBLYSTEGIUM VARIUM abc 1–11, 13, 15–18, 20–26, 29–37, 39–42, 44–58, 60–68, 70, 71, 73–80, 82–84, 87–99

AMBLYSTEGIUM VARIUM var. OVATUM bc 7, 10, 11, 41, 42, 50, 61, 62, 68, 77, 90

AMBLYSTEGIUM VARIUM var. PARVULUM c 37, 42, 49, 52, 54, 64

ANOMODON ATTENUATUS abc 3–6, 8–11, 14, 17, 18, 20, 21, 26, 30, 31, 35–37, 39–42, 45–48, 50–55, 58–66, 68, 70–73, 76–78, 85, 87–89, 93–95, 98, 99

ANOMODON MINOR abc 1, 3–15, 17, 19–29, 31–33, 35–38, 40–42, 45, 47–59, 61–67, 69–71, 73–78, 80–85, 88–99

ANOMODON ROSTRATUS abc 3, 4, 6, 8–11, 14, 17, 18, 20, 21, 24, 27, 33, 37, 39, 41, 42, 47, 48, 50–55, 60–66, 70–74, 76–78, 82, 84, 85, 87–89, 93, 95, 97–99

APHANORHEGMA PATENS b 37, 50, 60, 70

APHANORHEGMA SERRATUM abc 4, 37, 39, 47, 60–63, 72, 73, 76, 77, 98

ASTOMUM MUHLENBERGIANUM be 2–4, 31, 36, 42, 50, 53, 56, 61–64, 72, 75, 77, 79, 80, 85, 88

ATRICHUM ANGUSTATUM abc 3–5, 7–11, 14, 17, 19–22, 26, 29, 30, 35, 37–42, 46–49, 51–54, 58, 59, 61–64, 66, 68, 70–78, 82–84, 86–88, 92, 94–99

ATRICHUM CRISPUM ab 52

ATRICHUM MACMILLANI bc 17, 52, 78, 88

ATRICHUM UNDULATUM abc 3–7, 9–11, 17, 18, 21, 31, 33, 35, 37, 39, 41, 42, 44, 45, 47, 48, 50, 52, 53, 55, 59–65, 69, 71, 73, 75–77, 79, 82, 84, 86–89, 94, 95, 98, 99

ATRICHUM UNDULATUM var. HAUSKNECHTII c 64

ATRICHUM UNDULATUM var. MINUS 42 (Savage Herbarium)

ATRICHUM UNDULATUM var. SELWYNII bc 3, 4, 6–9, 11, 17, 21, 24, 26, 31, 42, 46, 51–55, 58, 60, 62–65, 70, 75, 80, 81, 87, 89, 90, 93

AULACOMNIUM HETEROSTICHUM abc 10, 11, 21, 37, 47, 50, 52, 54, 62, 63, 71–73, 77, 86–88, 97, 99

AULACOMNIUM PALUSTRE abc 3, 4, 52, 77

BARBULA FALLAX abc 1, 3–5, 8, 10, 11, 15, 17, 18, 20, 21, 25, 30, 36, 37, 41–43, 47–50, 52–54, 61, 63, 64, 70–72, 75, 77, 85, 89, 98, 99

BARBULA REFLEXA b 8, 18

BARBULA UNGUICULATA abc 1–6, 8, 10, 11, 13, 14, 17–23, 25, 27, 30, 31, 33–37, 41, 42, 44, 45, 47–53, 55–58, 61–71, 73, 75–77, 80, 83, 85, 87–93, 96, 98, 99

BARTRAMIA POMIFORMIS abc 4, 10, 11, 20, 21, 35, 37, 41, 42, 47–52, 54, 61, 63, 64, 68, 70–73, 75, 77, 86–88, 96, 99

BRACHYTHECIUM CAMPESTRE abc 59, 62, 64, 77

CLIMACIUM AMERICANUM abc 4, 10, 11, 17, 20, 21, 35, 37, 40–42, 47, 48, 52–54, 59, 63, 64, 70–73, 75–77, 86–88, 94, 96, 98, 99
CLIMACIUM DENDROIDES bc 3, 21, 77
CRATONEURON FILICINUM b 4, 20
DESMATODON COLORADENSIS b 47
DESMATODON OBTUSIFOLIUS abc 10, 11, 17, 20, 21, 35, 37, 41, 42, 46, 47, 50, 52–54, 61, 62, 64–66, 72, 74, 77, 78, 85, 88, 98, 99
DESMATODON PLINTHOBIUS abc 41, 54, 62, 77, 88
DESMATODON PORTERI abc 11, 52, 53, 73, 77
DICRANELLA HETEROMALLA abc 3, 4, 7, 8, 10, 11, 17, 19–21, 26, 30, 35, 37, 39, 40, 42, 45, 47, 48, 51–53, 55, 58, 61–64, 66, 68, 71–78, 86–88, 92, 93, 96, 98, 99
DICRANELLA RUFESCENS c 64, 77
DICRANELLA VARIA abc 3–5, 8, 10, 11, 30, 31, 37, 42, 44, 46, 47, 50, 52, 53, 55, 58, 61, 63, 64, 67, 73, 75–77, 83, 86, 88, 96, 98, 99
DICRANUM BONJEANI b 11
DICRANUM CONDENSATUM bc 61, 63
DICRANUM FLAGELLARE abc 9–11, 21, 37, 42, 53, 62, 64, 72, 76, 77
DICRANUM FULVUM b 10, 11
DICRANUM MONTANUM abc 8, 10, 11, 21, 35, 37, 40–42, 47, 53, 73
DICRANUM RUGOSUM b 42
DICRANUM SCOPARIUM abc 4, 10, 11, 21, 35, 37, 41, 42, 47, 48, 52–54, 61-64, 73, 77, 84, 86, 88, 96–99
DICRANUM VIRIDE abc 10, 11, 21, 42
DIDYMODON RECURVIROSTRIS abc 3, 8, 10, 11, 17, 20, 21, 37, 41, 42, 46, 52, 53
DIDYMODON RIGIDULUS b 10, 41
DIDYMODON TOPHACEUS bc 71, 89
DIDYMODON TRIFARIUS bc 10, 21, 41, 42
DISTICHIUM CAPILLACEUM abc 10, 11, 21, 42
DITRICHUM LINEARE bc 10, 35, 41, 52, 62, 63, 77
DITRICHUM PALLIDUM abc 6, 10, 11, 21, 37, 40–42, 47, 48, 52, 53, 55, 62–65, 73–77, 82, 84–86, 88, 96–98
DITRICHUM PUSILLUM abc 3, 9, 10, 20, 21, 23, 37, 40, 41, 47, 52, 55, 61–65, 70, 75, 77, 86, 88, 96
DREPANOCLADUS ADUNCUS var. KNEIFFII abc 1, 3, 7, 14, 15, 17, 33
DREPANOCLADUS ADUNCUS var. KNEIFFII fo. INTERMEDIUS b 3, 4, 17
DREPANOCLADUS ADUNCUS var. POLYCARPUS bc 2–4, 11, 14, 17, 36, 37, 63, 76, 77
DREPANOCLADUS ADUNCUS var. POLYCARPUS fo. GRACILESCENS abc 2–4, 15, 37, 46, 50, 76
DREPANOCLADUS ADUNCUS var. POLYCARPUS fo. UNCUS abc 3, 17, 37
DREPANOCLADUS ADUNCUS var. TYPICUS bc 2–4, 6, 14, 15, 42, 52, 63, 64
DREPANOCLADUS INTERMEDIUS b 3, 4
DREPANOCLADUS REVOLVENS Hb. Wolden 4
DREPANOCLADUS SENDTNERI bc 2, 3, 47
DREPANOCLADUS SENDTNERI var. GRACILESCENS bc 3, 36

ORTHOTRICHUM STELLATUM abc 10, 11, 42, 76, 77, 96
ORTHOTRICHUM STRANGULATUM bc 10, 11, 17, 20, 22, 41, 42, 47, 52–54, 64
PHASCUM CUSPIDATUM var. AMERICANUM abc 3, 31, 39, 42, 50, 52, 60–62, 64, 70–72, 77, 86
PHILONOTIS FONTANA c 76
PHILONOTIS LONGISETA bc 11, 72, 77, 98
PHILONOTIS MARCHICA bc 42, 98
PHYSCOMITRIUM HOOKERI bc 1, 3, 4, 10, 11, 17, 26, 42, 47, 53, 62, 77, 86
PHYSCOMITRIUM IMMERSUM abc 37, 61, 62, 77, 98
PHYSCOMITRIUM KELLERMANI bc 37, 41
PHYSCOMITRIUM KELLERMANI var. DRUMMONDII b 3, 10, 22, 62, 88
PHYSCOMITRIUM TURBINATUM abc 1, 3, 4, 7–11, 14, 15, 17, 19, 21, 22, 27, 29–32, 35–37, 40–42, 47–55, 58–64, 67–71, 73–78, 83, 84, 86–88, 90, 92, 93, 95, 96, 98, 99
PLAGIOPUS OEDERI abc 8–11, 21, 42, 47, 52, 77
PLAGIOTHECIUM DENTICULATUM bc 4, 21, 37, 39, 40, 42, 52, 53, 63, 77
PLAGIOTHECIUM DEPLANATUM abc 3–6, 8–11, 14, 17, 18, 20–22, 24, 26, 31–33, 35, 37, 39, 41, 42, 47, 48, 50–56, 58, 60–67, 69, 71, 73, 76, 77, 83–85, 90, 94, 97, 98
PLAGIOTHECIUM GEOPHILUM bc 21, 42, 49, 50, 64, 72, 73, 76, 77, 85, 86, 89, 98, 99
PLAGIOTHECIUM ROESEANUM abc 10, 11, 21, 35, 37, 52, 62, 64, 71–73, 77, 78, 98
PLAGIOTHECIUM SYLVATICUM bc 10, 21, 37, 40, 52, 72, 73, 77, 78
PLATYGYRIUM REPENS abc 1–11, 13–17, 19–22, 26, 28–30, 35, 37–42, 45, 47, 48, 50–55, 57, 58, 60–66, 68–77, 80, 83, 85–87, 89–99
PLEURIDIUM SUBULATUM abc 10, 40, 42, 50, 52, 53, 61–64, 74, 77, 94, 96, 97
POGONATUM PENSILVANICUM abc 73, 75, 77, 86, 88
POHLIA ANNOTINA var. DECIPIENS abc 10, 21, 37, 86
POHLIA ATROPURPUREA b 31 (W. R. Mills)
POHLIA CRUDA abc 10, 11, 17, 21, 35
POHLIA DELICATULA b 58
POHLIA ELONGATA bc 10, 21, 37, 77, 86
POHLIA NUTANS abc 1, 4, 8, 10, 11, 21, 32, 35, 37, 42, 52, 61–64, 71, 72, 74, 76, 77, 86, 88, 97–99
POHLIA PULCHELLA c 77
POHLIA WAHLENBERGII abc 1, 3, 4, 6, 9–11, 13, 14, 17, 20, 21, 25, 33, 35–37, 40, 42, 46, 47, 50–52, 56, 58, 61–65, 68–70, 72–74, 76, 77, 83, 84, 86, 89, 94, 96, 98, 99
POLYTRICHUM COMMUNE abc 3, 9–11, 17, 20, 21, 35, 37–42, 47, 48, 50, 52, 53, 61–64, 71–78, 86, 88, 99
POLYTRICHUM JUNIPERINUM abc 1, 3, 4, 8, 10, 11, 18, 20, 21, 30, 35, 37, 40–42, 46–48, 51–54, 61–64, 70, 73–77, 86–88, 96–99
POLYTRICHUM OHIOENSE abc 11, 21, 42, 47, 52, 53, 62, 63, 84, 88, 96, 98, 99

TORTULA MURALIS c 1
TORTULA PAGORUM b 52, 94
TORTULA RURALIS abc 1, 10, 11, 42, 52
TRICHOSTOMUM CYLINDRICUM b 11
WEISIA VIRIDULA abc 3, 4, 7, 9–11, 16–19, 21, 29, 30, 35–37, 40–42, 47–55, 58, 61–65, 67–72, 74, 75, 77, 85, 87, 88, 90, 92, 94, 96, 98, 99

HEPATICAE

BAZZANIA TRILOBATA bc 21
BLASIA PUSILLA abc 21, 30, 41, 52, 61–64, 71, 72, 77, 86
BLEPHAROSTOMA TRICHOPHYLLUM bc 11, 21, 77
CALYPOGEIA FISSA b 99
CALYPOGEIA TRICHOMANIS bc 52, 72, 77
CEPHALOZIA BICUSPIDATA bc 64, 77
CEPHALOZIA CONNIVENS abc 42, 52, 77
CEPHALOZIA MEDIA bc 53, 64, 77
CEPHALOZIELLA BYSSACEA b 10, 11, 21, 35, 61, 62, 77, 86
CEPHALOZIELLA HAMPEANA bc 62, 74, 77, 86
CEPHALOZIELLA PULCHELLA b 11
CHILOSCYPHUS FRAGILIS bc 10, 11, 35, 37, 39, 47, 64, 71, 73, 77
CHILOSCYPHUS PALLESCENS bc 4, 20, 41, 52
CHILOSCYPHUS POLYANTHUS abc 3, 10, 11, 35, 37, 47, 50, 61, 64, 77
COLOLEJEUNEA BIDDLECOMIAE abc 8, 10, 11, 21, 42, 53, 73
CONOCEPHALUM CONICUM abc 3, 4, 10, 11, 15, 17, 20–22, 31, 35–37, 41, 42, 46–48, 50, 52–54, 63–66, 68, 71–77, 86, 89, 90, 98
FRULLANIA BOLANDERI b 4
FRULLANIA EBORACENSIS abc 1, 3–6, 8–11, 14, 17, 18, 20, 21, 28–30, 35, 37–42, 47–53, 58–68, 70–77, 80–89, 91–99
FRULLANIA INFLATA abc 3, 4, 6, 7, 11, 14, 15, 21, 22, 25, 48, 53, 54, 60, 63, 67–71, 79, 80, 82, 90–92
FRULLANIA RIPARIA abc 10, 11, 20–22, 41, 42, 51–54, 59, 64, 65, 70, 73, 74, 77, 89, 94, 95, 98, 99
FRULLANIA SQUARROSA bc 11, 20, 26, 35, 42, 52–54, 62, 64, 70, 73, 77, 85, 94, 95, 98
HARPANTHUS SCUTATUS bc 21
JAMESONIELLA AUTUMNALIS abc 8, 10, 11, 20, 21, 35, 37, 47, 52, 62, 72, 77, 86
JUNGERMANNIA LANCEOLATA bc 21
JUNGERMANNIA PUMILA b 73
LEICOLEA BADENSIS bc 47, 98
LEPIDOZIA REPTANS abc 10, 11, 21, 37, 42, 52
LOPHOCOLEA HETEROPHYLLA abc 4, 5, 8–11, 20, 21, 35, 37, 39–42, 47, 50, 52, 53, 61–64, 68, 71–74, 76–78, 84, 86, 87, 90, 94, 96–99
LOPHOCOLEA MINOR abc 3, 4, 8–11, 21, 37, 40–42, 47, 51–53, 61, 63, 72, 73, 77, 86, 87, 99
LOPHOZIA MILDEANA b 62
LUNULARIA CRUCIATA c 64

MANNIA FRAGRANS abc 1, 3, 4, 10, 11, 13–14, 18, 20, 42, 52–54, 64, 72, 77
MANNIA PILOSA b 10
MANNIA RUPESTRIS ab 10
MARCHANTIA POLYMORPHA abc, 3, 4, 6, 9–11, 15, 17, 18, 20, 21, 30, 31, 35–37, 41, 42, 46, 48, 50, 52–54, 62–65, 69, 72, 73, 75–77, 98
NOWELLIA CURVIFOLIA b 86
ODONTOSCHISMA PROSTRATUM bc 52
PLAGIOCHILA ASPLENIOIDES abc 4, 6, 8, 10, 11, 20, 21, 37, 41, 42, 47, 48, 50, 52, 53, 61–65, 70–73, 77
PLECTOCOLEA HYALINA abc 11, 35, 52, 61, 72, 73, 77, 86, 99
PORELLA PINNATA b 89
PORELLA PLATYPHYLLA bc 21, 42, 54, 58, 64
PORELLA PLATYPHYLLOIDEA abc 4, 8–11, 17, 18, 20–22, 37, 40–42, 47, 48, 50–54, 58, 61, 63–65, 70, 72–74, 76, 77, 88, 89, 98, 99
PREISSIA QUADRATA abc 10, 11, 20, 21, 35, 37, 42, 47, 52, 53, 77
PTILIDIUM PULCHERRIMUM bc 11, 21, 42, 53
RADULA COMPLANATA abc 9, 11, 21, 42, 62
REBOULIA HEMISPHAERICA abc 1, 4, 10, 11, 20, 21, 30, 35, 37, 41, 42, 46, 47, 50–54, 61, 62, 64–66, 68, 71–77, 89, 90, 96, 98, 99
RICCARDIA PINGUIS b 3, 4, 62, 77
RICCIA BEYRICHIANA bc 15, 37, 39, 47, 50, 60–62, 77, 96
RICCIA FLUITANS abc 2–4, 6, 14, 15, 17, 24, 36, 52, 61, 62, 64, 76, 78, 90, 99
RICCIA FROSTII abc 1, 4, 5, 15, 31, 39, 50, 60–63, 76
RICCIA SULLIVANTII abc 43, 50, 60–62
RICCIOCARPUS NATANS abc 3–7, 13–15, 17, 24, 31, 37, 39–41, 45, 47, 49, 50, 52, 54, 61–64, 70, 73, 76–78, 98
SCAPANIA NEMOROSA abc 21, 72, 73, 77, 86
TRITOMARIA EXSECTA abc 11, 21
TRITOMARIA EXSECTIFORMIS bc 10, 21

ANTHOCEROTAE

ANTHOCEROS LAEVIS abc 4, 9, 10, 21, 37, 47, 48, 50, 52, 55, 61–65, 72–74, 76, 77, 86, 99
ANTHOCEROS PUNCTATUS bc 10, 15, 61–63, 77, 86
ANTHOCEROS CRISPULUS b 52, 61, 62
NOTOTHYLAS ORBICULARIS ab 15, 39, 50, 61, 62

GRINNELL COLLEGE AND
STATE UNIVERSITY OF IOWA

LUISIERELLA, A GENUS OF MOSSES NEW TO NORTH AMERICA*

WILLIAM CAMPBELL STEERE

In a survey of the bryophytes of Puerto Rico between August, 1939, and June, 1940, I made nearly a dozen collections of *Gyroweisia Barbula* (Schwaegr.) Paris in different parts of the Island. Since the Department of Biology of the University of Puerto Rico had very generously given me all facilities for research, I was able to make a careful study of this species during the spring of 1940. By a curious coincidence, I had made a thorough investigation of the European and temperate North American species of *Gyroweisia* only the year before (Steere 1939), and consequently was struck at once by the lack of relationship between *G. Barbula* and the two species of temperate climates, *G. tenuis* and *G. reflexa*. *Gyroweisia Barbula* is clearly distinguished from the other species of the genus by the sharply differentiated hyaline basal cells which extend upward along the leaf margins, much as in *Tortella*, and by the leaf cells mamillose on both surfaces. It also differs in other ways; for example, in the remarkable pellucid appearance of the green cells, in the variable peristome, and in the very distinct geographical distribution.

It seemed to me that a species with so many unique features amply deserved generic status, and I was prepared to propose a new genus name for it when my studies on Puerto Rican bryophytes might reach completion. The necessity for a new generic name for *Gymnostomum Barbula* Schwaegr. is also indicated by the uncertainty of most authors concerning the genus to which it belongs, as reflected by the remarkable accumulation of synonyms by so little-known a species. It was transferred to *Hyophila* by Hampe (1846), to *Pottia* by Müller (1849), to *Weisia* by Mitten (1869), to *Tortula* and to *Hymenostylium* by the same author (1885), to *Gyroweisia* by Paris (1902), to *Tuerckheimia* by Hilpert (1933), and to *Desmatodon* by Grout (1940). It would be difficult to find another equally rare species with so varied a nomenclatorial career, since in addition to the vicissitudes already related, this species has been redescribed under several other names.

In returning to the study of my Puerto Rican collections recently, I was again confronted by this problem, and began a search of the

* Paper from the Department of Botany and the Herbarium of the University of Michigan. Published with aid of a grant from the Rackham Fund of the University of Michigan.

literature on West Indian bryophytes for references to *Gyroweisia Barbula*. It is a surprising fact that the most recent and most comprehensive treatment of the Cuban mosses (Thériot 1939) makes no reference to this species, which was originally described from Cuba and has been reported several times since from that island. A careful analysis of Thériot's notes and descriptions of new species in the Pottiaceae led me to the realization that "*Luisierella stenocarpa* Biz. & Thér. sp. nov." could be nothing else but the missing *Gyroweisia Barbula*. An examination of Thériot's illustrations (Pl. 34, figs. 4a–f) gives further confirming evidence, especially with regard to the disposition of the hyaline basal cells of the leaves. The next step was an examination of the original description of the genus *Luisierella*, which was proposed for a Brazilian species, *L. pusilla* Thér. & P. de la V. Although the authors (Potier de la Varde 1936) remark prophetically that "son aspect est celui d'un minuscule *Barbula* ou d'un *Gyroweisia*," they apparently did not think to compare it with *G. Barbula*, which was already known from Brazil. From the description and the illustrations of *L. pusilla* alone, I am sure that it is also a synonym of *G. Barbula*, or rather, that *G. Barbula* must be transferred to *Luisierella*, since we have here the long-needed new genus established for it. The agreement between the careful drawing of the leaf-base of *G. Barbula* by R. S. Williams, published by Grout (1940, pl. 114, fig. 19) and the parallel drawing of *Luisierella pusilla* by Potier de la Varde (Fig. 1, no. 7) is truly striking. The peculiar bulbous vaginula is also well shown in both illustrations, as is the agreement in leaf shape, areolation and general habit.

LUISIERELLA **Barbula** (Schwaegr.) n. comb.

Gymnostomum Barbula Schwaegr., Suppl. II. **2**: 77. *Pl. 175*. 1826.
Hyophila Barbula Hampe, Bot. Zeit. **4**: 267. 1846.
Pottia Barbula C. Müll., Syn. Musc. **1**: 558. 1849.
Weisia Barbula Mitt., Journ. Linn. Soc. Bot. **12**: 136. 1869.
Tortula melanocarpa Mitt., Ibid. **15**: 60. 1876.
T. Barbula Mitt., Rept. Voy. Challenger, Bot. **1** (2): 91. 1885.
Hymenostylium Barbula Mitt., Ibid. **1** (2): 91. 1885.
Gyroweisia cubensis Broth., E. & P., Pflanzenf. **1**: **389**. 1902 (*nomen nudum*).
G. Barbula Paris, Index, II ed. **2**: 299. 1904.
Tuerckheimia Barbula Hilpert, Beih. Bot. Centralbl. **50** (2): 656. 1933.
Luisierella pusilla Thér. & P. de la V., Bull. Soc. Bot. France **83**: 74. *Figs. 1–20*. 1936.

L. stenocarpa Biz. & Thér., Mem. Soc. Cubana Hist. Nat. **13**: 273. *Pl. 34, figs. 4a–f.* 1939.

Desmatodon Barbula Grout, Moss Fl. N. Amer. **2** (5): 271. *Pl. 114, figs. 12–20.* 1940.

TYPE LOCALITY: Cuba ("Ad rupes calcareas Cubenses legit clar. D. Poeppig").

DISTRIBUTION: Florida; Bermuda, Bahamas, Cuba, Haiti, Puerto Rico, Jamaica; British Honduras (*E. B. Mains 3732*); Brazil.

LITERATURE CITED

GROUT, A. J. 1940. Appendix to Volume II. Moss Flora of North America, north of Mexico. **2** (5): 271. *Pl. 114, f. 12–20.*

POTIER DE LA VARDE, R. 1936. *Luisierella* Thér. et P. de la V. genus novum familiae Pottiacearum, s. f. Pottioidearum. Bull. Soc. Bot. France **83**: 73–76. *Fig. 1, 1–20.*

STEERE, W. C. 1939. *Gyroweisia tenuis* in North America. THE BRYOLOGIST **42**: 16–23. *Figs. 1–31.*

THÉRIOT, I. 1939. Complément au catalogue des mousses de Cuba et révision de plusieurs genres. II. Mem. Soc. Cubana Hist. Nat. **13**: 265–282. *Pl. 34–35.*

SOME ARKANSAS LICHENS

ALBERT W. C. T. HERRE

Apparently nothing has ever been published on the lichens of Arkansas, except a few references on the occurrence of certain species there. Tuckerman gives 3 species, collected by Dr. Peters, and Fink lists but 5. Berry lists 18 species of *Parmelia* from Arkansas. It is therefore evident that very little is definitely known of the general lichen flora of this state, which not only has a varied topography but also occupies a strategic position for the meeting and commingling of various floras.

I therefore asked my friend Dr. Delzie Demaree, chairman of the division of natural sciences at the Agricultural College of Arkansas, to collect and send me any available lichens. This he kindly did, and the following list of 42 species is the result. Naturally only the commoner and more conspicuous species were collected. Adding to my list the species previously recorded gives a total of 54 species, which is probably an eighth of the species occurring within the state.

The Ozark region is one abounding in life, well known for its rich and varied flora of flowering plants and its equally rich and diversified fish fauna. Boreal, Appalachian and Rocky Mountain elements commingle, and many endemics occur. The same factors that have brought this about should likewise produce a rich and varied lichen flora. No doubt this will be discovered when the Boston Mountains

are thoroughly explored. Further south lichens characteristic of Texas are already known, and others await collection. The bottom lands of the south-eastern corner of the state, with an altitude of 150 feet and less, should yield many rarities, hitherto known only from the Gulf Coast. Careful search in every part of the state would not only add greatly to the flora of Arkansas, but would also vastly increase our knowledge of lichen distribution and our comprehension of the ecological factors concerned.

My thanks are due to Dr. Demaree and his assistant, Ercerline Trantham, for their efforts in getting together the collection. To Dr. Alexander W. Evans, the eminent botanist of Yale University, I am under great obligations. He examined nearly all the *Cladoniae*, and his determinations of them have been followed; a few specimens only, concerning which there could be no doubt, were not seen by him.

Dr. Demaree did most of his collecting at the following localities:— Conway Co., Petit Jean State Park, at an altitude of 1100 feet; Drew Co., at the college farm, at an altitude of 250 feet; and Logan Co., Magazine Mountain, Ozark National Forest, at 2830 feet. Specimens from these localities are merely listed by county, to save needless repetition.

It is hoped that this brief list and few notes may encourage some one to collect and study the rich lichen flora of Arkansas.

PELTIGERACEAE

PELTIGERA HORIZONTALIS (Huds.) Baumg. Conway County, on damp bluff.

PELTIGERA CANINA (L.) Willd. Conway Co., on base of tree, *No. 25278*.

LECIDACEAE

LECIDEA TESSELLINA Tuck. Thallus yellow, then red with K. Spores 4.5 to 5 by 7.75 to 8 μ. Conway Co., on talus slopes, *No. 24979*. Logan Co., *Nos. 25139, 25140*.

CLADONIACEAE

CLADONIA RANGIFERINA (L.) Web. *f.* CRISPATA Coem. Izard Co., Calico Rock, alt. 450 feet; *No. 23448*.

CLADONIA SUBTENUIS (des Abbayes) Evans. Bradley Co., Warren, on barren soil, at 150 feet. Conway Co., on rocky bare areas, *Nos. 22809, 23053, 25204, 25324*. Garland Co., near Hot Springs, alt. 600 feet, on rocky wooded bluffs; *No. 22745*. Izard Co., Calico Rock, alt. 450 feet; *No. 23447*. Pulaski Co., near Little Rock, alt. 500 feet; *No. 24182*.

CLADONIA BACILLARIS (Delis.) Nyl. Conway Co., on base of dead pine tree, *No. 25326*.

CLADONIA CRISTATELLA Tuck., *f.* ABBREVIATA Merrill. Conway Co., on old decaying log, *No. 25259.*

CLADONIA LEPORINA E. Fries. Conway Co., on bare exposed rocks; *Nos. 25204, 25205.*

CLADONIA UNCIALIS (L.) Web. Conway Co., on dry bare bluffs, *No. 25111;* on bare rocky areas, *No. 25203.*

CLADONIA BORYI Tuck. Conway Co., on bare places, *No. 23052.*

CLADONIA FURCATA (Huds.) Schrader. Logan Co., on bare areas, *No. 22828.*

CLADONIA FURCATA var. RACEMOSA (Hoffm.) Floerke. Conway Co., on bare rocky areas, *No. 22810.* Logan Co., *No. 25143.*

CLADONIA CAPITATA (Michx.) Sprengel. 1827. Dr. Evans has recently shown that this name must supersede *Cladonia mitrula* Tuck., 1853. Drew Co., at the base of a tree, *No. 24633.*

CLADONIA CHLOROPHAEA (Floerke) Sprengel. Conway Co., on old decayed log, *Nos. 25259, 25321.* Garland Co., Hot Springs, alt. 600 feet, on bare ground, *No. 22748.* Pulaski Co., Little Rock, alt. 500 feet, on tree trunks near the ground, *No. 24174.*

CLADONIA FIMBRIATA (L.) E. Fries. Conway Co., on an old log, *No. 25201.*

CLADONIA ROBBINSI Evans. Conway Co., on bare rocky areas, *Nos. 22815, 23051.* Garland Co., Hot Springs, alt. 600 feet, on bare ground *No. 24138.* Pulaski Co., Fourche Mt., near Little Rock, alt. 500 feet, *No. 22727.*

CLADONIA STREPSILIS (Ach.) Wainio. Conway Co., on dry bare bluffs, *No. 25109;* on an old log, *No. 25201.*

CLADONIA STREPSILIS f. COMPACTA Anders. Conway Co., on bare rocky areas, *Nos. 25109, 25202.* Garland Co., Hot Springs, alt. 600 feet, on hillsides in open woods, *No. 22746.*

ACAROSPORACEAE

ACAROSPORA CITRINA (Taylor) A. Zahlbr. Conway Co., on dry talus, *No. 25114.*

PERTUSARIACEAE

PERTUSARIA LEIOPLACA (Ach.) DC. Drew Co., Agricultural College farm, on oaks, *No. 25128.* One mile south of college campus, on *Carpinus; No. 24987.* Spores 2–8 in an ascus, 23 to 40 μ by 52 to 125 μ.

PERTUSARIA MULTIPUNCTA (Turn.) Nyl. Drew Co., Agricultural college farm, on *Quercus falcatus, No. 25124.* One mile south of college campus on *Carpinus, No. 24987B.*

LECANORACEAE

LECANORA CUPRESSI Tuck. Drew Co., near Alice, alt. 150 feet, on pinebark, *No. 25135.* Spores 3 to 4.4 μ by 7.5 to 11 μ.

LECANORA SUBFUSCA (L.) Ach. Drew Co., near Alice, elevation 150 feet, on pine tree, *No. 25135B.*

LECANORA CINEREA (Ach.) Röhling. Conway Co., on rocks on dry bluffs, *No. 25118.*

LECANORA GIBBOSA (Ach.) Nyl. Conway Co., *No. 25113;* mixed with *Buellia aethalea.*

PARMELIACEAE

PARMELIA CONSPERSA (Ehrh.) Ach. Abundant on rocks. Conway Co., *Nos. 23056, 24982, 25200, 25206, 25207, 25115.* Logan Co., *Nos. 25133, 25134, 25141.* Garland Co., Hot Springs, alt. 700 feet, *No. 22747.*

PARMELIA LEUCOCHLORA Tuck. Bradley Co., Warren, on *Taxodium* knee, alt. 170 feet, *No. 24674A;* no reaction with K; medulla bright red with C. Also *No. 24251,* on tree in prairie, alt. 150 feet. Conway Co., on *Pinus echinatus, No. 25107.*

PARMELIA BORRERI Turner. Conway Co., on bark of *Pinus echinatus,* mixed with other Parmelias, *No. 25107.* Drew Co., near Alice, on oak, *No. 25132.*

PARMELIA RUDECTA Ach. Conway Co., on *Pinus echinatus, No. 25107.* Drew Co., college farm, on *Quercus stellatus, Nos. 25120, 25126, 25127, 25129.* Near Alice, on oak bark, collected by Ercerline Trantham, *Nos. 25130, 25132.* Wilmar, on old pine tree, elevation 150 feet, *No. 25199.*

PARMELIA QUERCINA (Willd.) Wainio. Bradley Co., near Warren, on tree in prairie, elev. 150 feet, *No. 24251.* Drew Co., Agricultural College farm, on *Quercus stellata, Nos. 25123, 25129.* Spores globose to rounded and short ellipsoid, 3.75 to 6 μ by 5 to 7.5 μ.

PARMELIA TEXANA Tuckerman. Drew Co., a mile south of Agricultural College campus, on *Carpinus, Nos. 24986, 24987.*

PARMELIA CETRATA Ach. Conway Co., on tree, *No. 25103.* Drew Co., Agricultural College farm, on *Quercus stellatus, No. 25120.* Wilmar, alt. 150 feet, on an old tree, spores 7.5 to 9 μ by 13 to 19 μ, *No. 25198.* Jefferson Co., Pine Bluff, alt. 200 feet, specimen fertile, *No. 24776.*

PARMELIA ERECTA Berry. Drew Co., Wilmar, on oak tree in prairie, Coll. Ercerline Trantham; mixed with other lichens, *No. 25199A.*

PARMELIA CAPERATA (L.) Ach. Bradley Co., near Warren, alt. 145 feet, on Bumelia; *No. 24648.* Conway Co., on sandstone bluffs, *No. 25104.* Drew Co., Agricultural College farm, on *Quercus stellatus, No. 25122.* On oak tree near Wilmar, alt. 150 feet; *No. 24632.*

PARMELIA CAPERATA var. INCORRUPTA (Moore) Berry. Independence Co., 6 miles north-east of Batesville, on bare rocks; *No. 25327.*

PARMELIA PERLATA (Hudson) Ach. Drew Co., Wilmar, alt. 150 feet, on pines, *No. 24634.*

PARMELIA PERLATA var. CILIATA (DC) Duby, f. CORALLINA Müll. Arg. Mixed with the species in *No. 24634.*

PARMELIA MICHAUXIANA A. Zahlbr. Bradley Co., near Warren, at 150 feet, on tree in prairie, spores 7.5 to 10 μ by 12.5 to 16.5 μ; *No. 24251.*

PARMELIA CRINITA Ach. Drew Co., on oak tree at Wilmar, alt. 150 feet; *No. 24632B.*

USNEACEAE

USNEA FLORIDA (L.) Hoffm. Bradley Co., on tree in prairie at Warren, alt. 150 feet; *No. 24251.* Conway Co., on talus slopes, specimens depauperate or juvenile, and sterile, *Nos. 24983, 25110.* Drew Co., on *Gleditsia* tree at Wilmar, elevation 145 feet; *No. 24116.* Jefferson Co., Pine Bluff, alt. 200 feet; *Nos. 24775, 24776.* Logan Co., on vertical rocky cliffs, specimens juvenile; *No. 25142.*

USNEA TRICHODEA Ach. Bradley Co., near Warren, at 145 feet altitude; *No. 24648.* Conway Co., on trees in Creek Bottom; *Nos. 25323, 25325.* Izard Co., Calico Rock, alt. 450 feet; *No. 23402.*

CALOPLACACEAE

CALOPLACA CINNABARINA (Ach.) A. Zahlbr. Conway Co., on dry bluffs, *Nos. 25117, 25119, 24980.* Logan Co., on talus slopes; *No. 25144.*

BUELLIACEAE

BUELLIA AETHALEA (Ach.) Th. Fr. Conway Co.; thallus yellow, then dark red with K. Spores 5 to 6 μ by 9 to 15.5 μ; *Nos. 25105, 25113.*

RINODINA OREINA (Ach.) Mass. Conway Co., mixed with *Caloplaca cinnabarina, No. 25119.* Logan Co., mixed with *Caloplaca cinnabarina, No. 25144.*

PHYSCIACEAE

PHYSCIA CLEMENTIANA (Ach.) Kickx. Conway Co., on dry sandstone bluffs; *No. 25106.* Drew Co., on old pine log at Wilmar, alt. 150 feet; *No. 24631.*

PHYSCIA TRIBACIA (Ach.) Nyl. Drew Co., on *Quercus falcatus* near the ground, at Agricultural College farm, *No. 25125.* On old pine tree at Wilmar, alt. 150 feet, *No. 25199.*

The following species of *Parmelia* not listed above, are given by Dr. Berry in his monograph.

PARMELIA SAXATILIS (L.) Ach. One collection, Chicot Co.

PARMELIA BOLLIANA Müll. Arg. One collection, Boone Co.

PARMELIA HUBRICHTI Berry. Two collections; Conway Co., and Newton Co.

PARMELIA SUBLAEVIGATA Nyl. Boone County, Chicot County, and Garland County, one collection each; Newton Co., 3 collections.

PARMELA AURULENTA Tuck. Garland County and Newton County; each one collection.

PARMELIA CRISTIFERA Taylor. Chicot County and White County, one collection each.

PARMELIA PERFORATA (Wulf.) Ach. Conway County, one collection; Newton County, three collections.

PARMELIA TINCTORIA Despr. Chicot County, one collection.

PARMELIA LATISSIMA Fee. Newton County, 2 collections.

Additional species recorded by Tuckerman and Fink from Arkansas

COLLEMA CYRTASPIS Tuck.
PERTUSARIA GLOBULARIS Ach. Recorded only by Fink.
ANAPTYCHIA COMOSA (Eschw.) Mass.

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STANFORD UNIVERSITY, CALIFORNIA.

A NEW WEISIA AND A NEW TORTULA FROM SOUTHWESTERN UNITED STATES

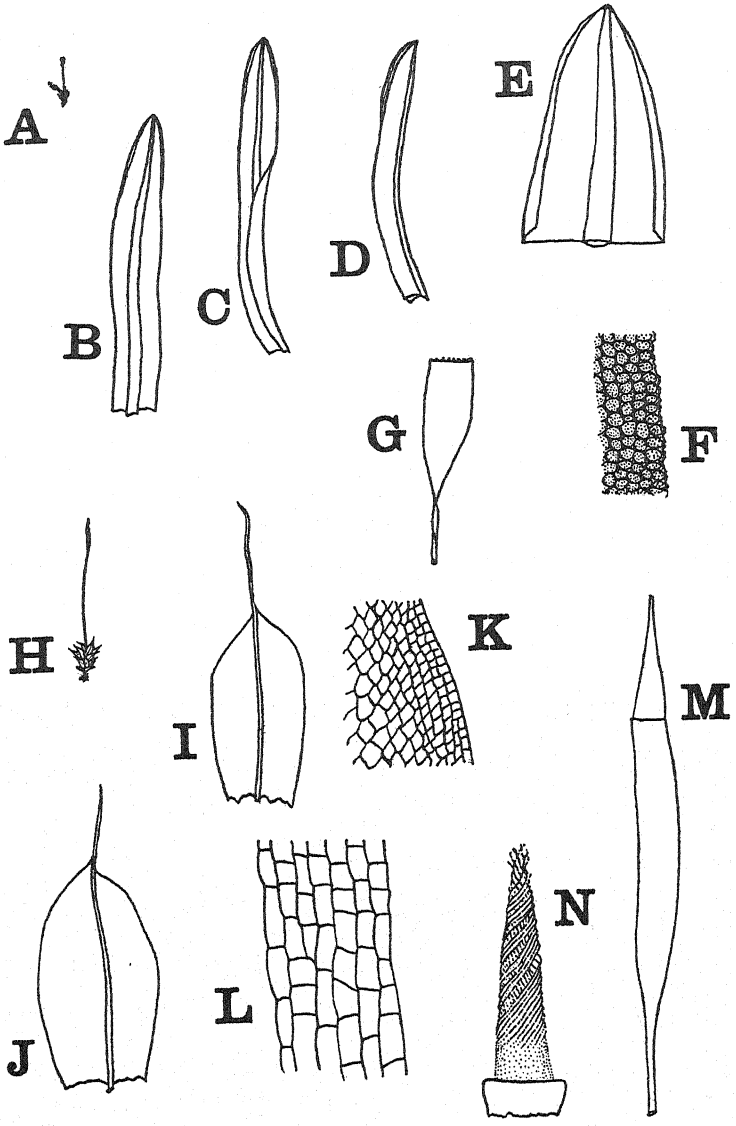
EDWIN B. BARTRAM

A series of mosses from southern California and adjacent regions collected in recent years by Dr. P. A. Munz, Mr. Nathan C. Sweet, Jr., and Mr. F. R. Fosberg was sent to me from Pomona College for determination. Among the usual run of well known species I find two packets of unusual interest representing two new and unusually clean-cut species which are described below. The types are in the writer's herbarium and duplicates in the herbarium of Pomona College, Claremont, California.

Weisia Sweetii Bartr. sp. nov. (Figs. A–G.)

Pusilla, caespitosa, caespitibus densiusculis, viridibus, intus pallide fuscis. Caulis erectus, ad 4 mm. altus, basi parce radiculosus. Folia sicca crispula, humida erecto-patentia, 1.5–2 mm. longa, linearilanceolata, carinato-concava, obtusa, minute mucronata; margines crenulato-papillosi, erecti vel superne anguste incurvi; costa valida, breviter excurrente, inferne sicca 75 μ lata; cellulae superiores rotundatae, obscurae, dense papillosae, diam. 5–7 μ, basilares rectangulares, hyalinae. Seta 4–5 mm. longa, tenuis; theca erecta, oblonga, 1 mm. longa; dentes peristomii breves, papillosi videtur. Caetera ignota.

Small plants growing in rather dense tufts, dull green above, brown below. Stems erect, to 4 mm. high, sparingly radiculose below. Leaves crispate when dry, erect-spreading when moist, 1.5–2 mm. long, linear-lanceolate, carinate-concave, obtuse, minutely mucronate; margins papillose-crenulate, erect or narrowly inflexed above; costa strong, about 75 μ wide below, short excurrent, with thick stereid bands on both sides of the median guide row; upper cells rounded, obscure, densely papillose, diam. 5–7 μ, basal cells rectangular, hyaline. Seta 4–5 mm. long, slender; capsule erect, urn oblong, 1 mm. long; peristome teeth short, papillose (only two old and eroded capsules seen).



EXPLANATION OF PLATE

WEISIA SWEETII. Figs. A–G. A. Plant, × 1. B, C. Leaves, × 24. D. Leaf in profile, × 24. E. Apex of leaf, × 120. F. Upper leaf cells and margin, × 267. G. Capsule × 16.

TORTULA CALIFORNICA. Figs. H–N. H. Plant, × 1. I, J. Leaves, × 16. K. Upper leaf cells and margin, × 120. L. Basal leaf cells, × 120. M. Capsule, × 12. N. Peristome, × 24.

NEVADA: Yant Pit Canyon, Virgin Mts., Clark Co., on ground, alt. 4600 ft., *N. C. Sweet No. 78*, June 5, 1941.

The obtusely pointed leaves minutely mucronate by the barely excurrent costa and the erect or narrowly inflexed leaf margins (not at all involute) will readily separate this species from any of its local allies. It is close to the border line but on the whole I think nearer *Weisia* than *Trichostomum*.

Tortula californica Bartr. sp. nov. (Figs. H–N)

Gregarie crescens, lutescens. Caulis brevissimus, 2–3 mm. altus, inferne parce radiculosus. Folia superiora 2–3 mm. longa, 1–1.25 mm. lata, oblongo-ovata, acuta, leniter concava, pilo hyalino, elongato, integro instructa; margines plani, integri; costa valida, in pilo longe excurrente; cellulae superiores pellucidae, laevissimae, rotundato-hexagonae, 25–30 μ latae, margines versus minores, basilares laxiores, hyalinae, breviter rectangulares. Seta 12–14 mm. longa, flavescens; theca anguste cylindrica, deoperculata 3 mm. longa, saepe leniter curvata; peristomii dentes pluries contorti, pallidi, membrana basilaris circa 0.3 mm. alta; operculum conico-rostratum, 1.5 mm. longum.

Small, yellowish, gregarious plants. Stems 2–3 mm. high, slightly radiculose below. Leaves crowded in a rosulate tuft, slightly contorted when dry, the upper 2–3 mm. long, 1–1.25 mm. wide, oblong-ovate, acute, slightly concave, hair-pointed; margins plane, entire; costa strong, excurrent in a long, hyaline, entire hair-point; upper cells pellucid, smooth, rounded-hexagonal, 25–30 μ wide, not incrassate, smaller toward margins, basal cells laxer, hyaline, short rectangular, thin walled. Seta 12–14 mm. long, yellowish; capsule erect or slightly curved, narrowly cylindrical, urn 3 mm. long; peristome teeth strongly spiralled from a basal membrane about .0.3 mm. high; operculum 1.5 mm. long, conic-rostrate; spores 10–12 μ in diam.

CALIFORNIA: Lower Decker Canyon, Elsinore Mts., Riverside Co., alt. 650 meters, on steep earth banks, Sta. no. 318, *F. R. Fosberg No. 307* (Los Angeles Museum No. 31024), March 26, 1930.

Widely distinct from all the North American species in the plane margined leaves with long, hyaline, entire hair-points and smooth cells. As Dr. Steere has remarked it is probably nearest *T. cuneifolia* (Brid.) Roth of Europe but is well distinguished by the long hair-pointed leaves and the higher basal tube of the peristome. I have been unable to determine the inflorescence from the limited material available.

Vol. 48, Number 1, containing pages 1–44, was issued March 23, 1945.

THE BRYOLOGIST

JOURNAL OF

THE SULLIVANT MOSS SOCIETY

VOL. 48 SEPTEMBER, 1945 No. 3

ROBERT STATHAM WILLIAMS (1859–1945)*

Robert Statham Williams died March 13, 1945, in Minneapolis, Minnesota, where he was born May 6, 1859.

As a boy Williams had become an ardent naturalist with an especially keen interest in birds and plants. He prepared a very complete set of mounted skins of Minnesota birds, but disposed of the collection to a public institution in Minneapolis in order to raise funds for exploration further afield. Even in later years, as he related this story, one could see his pride in the collection and his regret at having parted with it. When he was twenty years old, his love of the outdoors and of nature took him from Minnesota to Montana, at that time a real wilderness. Among other achievements there, he homesteaded the land and built the first cabin where the city of Great Falls now stands. We know very little about the life and work of Mr. Williams during his twenty years in Montana, except that he became a successful business man, miner and explorer, and that for a while he was a rider for the famous Pony Express. We may be certain, however, that he continued his natural history studies.

In 1898, in the early days of the "gold rush," Williams joined one of the parties hastening to the Yukon by way of Alaska. Fortunately, he had the acumen to engage in business rather than in the hazardous search for gold, and not only accumulated a small fortune but also had time to collect plants. His specimens of plants prepared during 1898 and 1899 represent the first extensive collections made there by a resident naturalist.

In 1899, he came to the then newly created New York Botanical Garden with his collections and the determination to devote his life to scientific work. He was appointed to the position of Museum Aid

* Published with the aid of a grant from the Horace H. Rackham Fund of the University of Michigan.

in December, 1899, which he held, mostly *in absentia*, until January, 1906, when he was named Assistant Curator. In 1910, he became Administrative Assistant, at which status he remained until 1932, after which his title was Research Assistant in Bryology.

Williams chose to work on mosses and the substantial report which he made on his own large collections of mosses from Alaska and the Yukon (1901) is a remarkably able and well-prepared contribution. He described a number of new species, one new genus, and reported many species new to the region. In 1901, Williams, as botanist, accompanied an exploration party which surveyed parts of eastern Bolivia for an English land company. After an eventful trip down the Amazon, he returned in 1903 to New York with enormous collections of plants from Peru and Bolivia and, as time permitted, prepared two important reports on the mosses (1903, 1909). Later in 1903, the New York Botanical Garden sent him to the Philippine Islands where he collected primarily on Luzon and Mindanao between 1903 and 1905. The large collections which he made furnished materials for his authoritative publication on Philippine mosses (1914). His last expedition was a much shorter one, to Panama, in 1908 (1911). Few botanists and fewer bryologists have been able to spend as much time in the field in different parts of the world, among unusually interesting floras, as Williams did in the decade between 1898 and 1908.

In 1909, the New York Botanical Garden acquired one of its most valuable possessions, the William Mitten Herbarium. This magnificent collection of bryophytes contains the type specimens of hundreds of new species described by Mitten from all parts of the world, and especially the mosses collected by Spruce and others in South America, upon which Mitten had based his classic "Musci Austro-Americani." When the purchase was made, Williams was sent to England to Mitten's home at Hurstpierpoint, in order to supervise the packing and shipping of the collection. He enjoyed this trip and spoke of it often in later years.

With the Mitten collection at hand for reference, Williams established himself more firmly as the American authority on exotic mosses. He was interested primarily in the floristic aspect of bryology and published upon many collections resulting from his own expeditions and those of others. Although he described a substantial number of new species, he did not accept this responsibility lightly. He made every effort to identify puzzling mosses with previously described

species before proposing them as new, and then prepared meticulously careful drawings to illustrate those details of diagnostic importance. Questions of phylogeny and relationship did not interest Williams overly much, and his species concept was uncomplicated by them. He had little sympathy with the recognition of subspecific, varietal and formal categories and held firmly to the belief that if a moss is different enough to deserve a name, then it should be of specific rank.

Williams prepared several painstaking and careful monographic revisions, of which the most important is probably his treatment of the Dicranaceae in the "North American Flora" (1913). His revision of the genus *Desmatodon* (1919) and of the Calymperaceae (1920) are are also noteworthy contributions.

Because of his association with the New York Botanical Garden, because he was one of the very few botanists who could devote full time to bryology, and because of his cooperative attitude, Williams was called upon by many botanists for help with the identification of mosses. Without any secretarial help, he managed to cope with a voluminous correspondence and bryologists throughout the world have his kindly and concise letters, all hand-written. Generous in time spent on naming specimens, he studied a truly enormous number of collections for amateur and professional botanists over the country. His only objection in this work was to inadequate or poorly prepared specimens, and his gentle remonstrations on this subject appear in print in THE BRYOLOGIST (1910). Although he was also much interested in lichens and named occasional collections, his published contributions to this field are few.

Williams was extremely retiring and reserved in his personal manner, yet always showed the greatest courtesy and consideration to visiting bryologists. His quiet manner covered a firm and independent spirit, however, and he was not easily deviated from any course which he had set for himself. It is a tribute to his self-discipline and severe application to his work that he weathered the many storms of his close association with Mrs. Elizabeth G. Britton for thirty years at the New York Botanical Garden. Mr. Williams lived entirely for his work and was apparently absolutely content with it. His only relaxation, so far as I know, was walking through the grounds of the Garden observing the plants and the birds. Bryologists may be surprised to learn that he contributed several articles on the birds of the Botanical Garden to its "Journal." In his extraordinarily wide travels, Williams

had collected many birds, and the room in the Bronx where he lived was a veritable museum, decorated with mounted birds from South America, the Philippines and from Bronx Park. He collected ornithological literature and had a substantial library on the subject. Since he was an incorrigible collector by nature he had several other but smaller interests in collecting.

It is remarkable that Williams was able to change himself suddenly from a roving naturalist into a serious and productive professional bryologist. It is just as strange that a man used to exploration and travel should have settled down to dedicate his life to herbarium work in an almost monastic fashion. Although he almost never attended meetings of scientists, he took a fairly active part in the botanical world. He was editor of the "Journal of the New York Botanical Garden" for the 1921 and 1922 volumes, and served as president of the Sullivant Moss Society from 1924 until 1930, the longest term of office which any president of our organization has yet held. In his quiet way, Williams was a substantial benefactor of the Society, since in addition to an annual gift of a hundred dollars while he was in office, he paid the expenses of making the engravings to illustrate his numerous papers in THE BRYOLOGIST. Although he never mentioned these philanthropies, they came to light in the annual reports of the secretary-treasurer.

The determination of the type specimens of the new species which Williams proposed and described is open to some question. Ostensibly, they are deposited in the herbarium of the New York Botanical Garden. Actually, Williams kept a personal herbarium based primarily on his own collections, but into which he distributed type material. This herbarium, together with the accompanying working library, was purchased by Mr. Donald Richards of Chicago and has been deposited by him in the herbarium of the Chicago Natural History Museum.

During the financial depression of the early 1930's, Williams lost all the savings of his early years in the failure of a great New York banking company in which he had invested them, a hard blow to a man of his independent spirit. The combination of worry over his economic situation, and his spartan way of life contributed to a serious illness in 1936, after which his enthusiasm for bryology gradually waned for several years. He finally retired to his boyhood home in Minneapolis where he remained until his death.

Robert Statham Williams will be remembered among future generations of botanists by a Philippine genus of flowering plants, *Williamsia* Merrill, and by a Bolivian genus of mosses, *Williamsiella* Britton. Few species of mosses were named in honor of Williams, since he rarely submitted his specimens to other bryologists for study. However, many species of flowering plants from the Yukon, Bolivia, the Philippines, and Panama bear his name.

Miss Ruth Williams has very kindly furnished some of the information included here, and I am further indebted to Dr. Frances E. Wynne for corrections and additions to the appended bibliography of Mr. Williams' publications.—WILLIAM CAMPBELL STEERE

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Notes on some Pleistocene mosses recently discovered. Journ. N. Y. Bot. Gard. **31**: 154. 1930.
Haitian mosses collected by E. C. Leonard. Journ. Wash. Acad. Sci. **20**: 173–180. *Fig. A, B.* 1930.
Colombian mosses, apparently undescribed. THE BRYOLOGIST **33**: 73–82. *Pl. X–XIV.* 1930.
Some apparently undescribed mosses from Peru, also new combinations. Revista Univ. Nac. Cuzco (Peru) **14**: 34–41. 1930.
Homalia Sharpii sp. nov. THE BRYOLOGIST **34**: 20–21. *Pl. II.* 1931.
Blindia Roerichii sp. nov. *Ibid.* **34**: 49–51. *Pl. III.* 1931.
Musci [of the Tyler-Duida Expedition]. Bull. Torrey Bot. Club **58**: 501–503. *Pl. 44–45.* 1931.
Two undescribed Himalayan mosses. THE BRYOLOGIST **35**: 1–5. *Pl. I–II.* 1932.
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Sciaromium Fryei sp. nov. *Ibid.* **35** (1932): 52–53. *Pl. V.* 1933.
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Una colección de musgos de los Andes Venezolanos. Bol. Soc. Venez. Ciencias Nat. **14**: 1–7. 1934. (Reprint, separately paged.)
Brachytherium reflexum (Starke) B. & S. THE BRYOLOGIST **38**: 30–31. *Pl. IV.* 1935.
Splachnobryum Kieneri sp. nov. *Ibid.* **38**: 92–94. *Pl. V.* 1935.
The Röll collection of N. Am. mosses. *Ibid.* **39**: 39. 1936.
Moenkemeyera Littlei sp. nov. *Ibid.* **39**: 40–41. *Pl. IV.* 1936.
A correction. *Ibid.* **40**: 66. 1937.
(With Elizabeth G. Britton) A new species of *Mnium* from Idaho and Montana. THE BRYOLOGIST **3** (1): 6–7. 1900.
(With Elizabeth G. Britton) Bryales. North American Flora **15**: 41–43. 1913.
(With Elizabeth G. Britton) Central American Mosses. Torreya **14**: 24–31. *Fig. 1.* 1914.

TAXONOMIC NOTES. IV. SCIAROMIUM LESCURII

A. LEROY ANDREWS

This moss is of decided interest as one of the distinct types endemic to eastern North America. Appropriately enough it was named by Sullivant[1] and after Lesquereux who had collected the type specimen. Sullivant placed it noncommittally in the genus *Hypnum*, in his day a very comprehensive one. It was in the compendium of Jaeger and Sauerbeck[2] included in the segregate genus *Amblystegium*,[3] which in so far as it signifies inclusion in the present family Amblystegiaceae has not been and is hardly likely to be questioned.[4] However with the progressive segregation of genera within this group it came to be felt quite rightly that it was too distinct to be contained either in *Amblystegium* or any other of the commonly segregated genera. Brotherus in his first treatment of the mosses for Engler and Prantl[5] accordingly placed it in the already existing genus *Sciaromium*, where with the prestige of Engler and Prantl it has been left by subsequent bryologists, including Grout.[6] This is however only adding one puzzle to another, or really to several.

Sciaromium is a genus of Mitten. First mention of it is presumably as a section, though not so designated, under the genus *Leskea* Hedw.,[7] where five species are mentioned, three of them new with descriptions and figures, all five now found in *Echinodium*.[8] Four years later the section was elevated to generic rank[9] with a back reference to Vol. 8, that is apparently still including the five original species, but with three further ones added. The first of these later ones, *S. conspissatum* (Hook. & Wils.) Mitt., Grout regards as the type species. These three are among the species still included by Brotherus in *Sciaromium* and it certainly simplifies things to agree with Grout as

[1] In Gray, Manual of Botany of the Northern United States, Ed. II: 679. 1856. This is the correct citation, cf. the valuable work of A. D. Rodgers III: "Noble Fellow" William Starling Sullivant (1940) 222 ff., together with the remarks of Wareham in the Appendix 307 ff. for the relative chronology of the publications of Sullivant in 1856 and 1857.

[2] Jahresber. d. St. Gall. Nat. Gesell. 1877–78: 290; this, not "554," is the page in this periodical publication of the Swiss learned society; however the combination *Amblystegium Lescurii* had been made already in 1870 by Austin in his list of labels for his Musci Appalachiani, p. 62, published as a pamphlet in Closter, N. J. in that year. Under *Amblystegium* the species should then be cited as *Amblystegium Lescurii* (Sull.) Aust.

[3] Not in its *Sciaromium*.

[4] Sullivant had already in 1856 included it in what he called the section *Amblystegium*.

[5] Natürl. Pflanzenf. 1³: 1030. 1908.

[6] North American Mosses North of Mexico 3: 75. 1931.

[7] Journ. Linn. Soc. Bot. 8: 7. 1865.

[8] Two other species mentioned, but not included, are in neither *Echinodium* nor *Sciaromium*.

[9] Journ. Linn. Soc. Bot. 12: 571. 1869.

to type species,[10] though it doesn't make much difference for our species, which should be excluded in any case.

Brotherus divided *Sciaromium* in both editions into three sections, following Dusén[11] for the second and third: 1. *Platyloma* (Kindb.) with our *S. Lescurii* as sole species: 2. *Limbidium* Dus. with 14 (2nd ed. 15) species, including the type, *S. conspissatum* (Hook. & Wils.) Mitt.; 3. *Aloma* Dus. with two subsections: A: *S. Bellii* Broth. from New Zealand and B: 2 species (in 2nd ed. 5) from South America and Australia. The several species of the section *Limbidium* which should constitute the real genus *Sciaromium*, if there is any question, are, Brotherus himself says, very closely related and could probably be reduced in number. Wherever Brotherus makes this statement one is generally justified in suspecting that a single species is involved. Certainly specimens from Chile and Patagonia in my herbarium under three of the separate names seem to be all the same thing and such illustrations as are available, including the unpublished ones of G. Roth, suggest the same interpretation. Their only connection with our species lies in the fact that both are aquatic or near aquatic in habitat and have differentiated leaf borders, as do in fact many species and genera of mosses.[12] The borders are not alike, those of the real *Sciaromium* (sect. *Limbidium*) being remarkably thickened, of a number of layers of cells or really rounded in section, while the border cells of *S. Lescurii* are simply elongated and with thicker walls as compared with the others.[13] As fruiting specimens of the real *Sciaromium* (sect. *Limbidium*) have not yet been found it is by no means certain and I think quite unlikely that it belongs in the Amblystegiaceae at all.

As to the section *Aloma*, I will make no present attempt to place it,[14] but I see no reason to regard it as congeneric with our *S. Lescurii*. Paris' "Index bryologicus"[15] assigned to *Sciaromium* 27 species, a conglomeration of the diverse forms placed by Brotherus in *Sciaromium*, *Echinodium* and *Hypnodendron* subgen. *Limbella*, with some others, but without mention of *S. Lescurii*, which had been included in *Amblystegium*.[16] Brotherus regarded *Echinodium* as so distinct that

[10] *Echinodium* had already been established by Juratzka in 1866.
[11] Bot. Notiser **1905**: 309 f.
[12] The section *Aloma*, as the name suggests, lacks a leaf border, except that *S. Bellii* is described as having one.
[13] Brotherus' statement that the border in *S. Lescurii* has two layers of cells is erroneous.
[14] My specimen of *S. Bellii* has, judging from Dixon's description (Bryology of New Zealand 314. 1929), come to me misnamed and is quite clearly what Brotherus calls *Cratoneuropsis relaxa* (Hook. & Wils.) Fleisch.
[15] Ed. II, **4**: 237 ff. 1905.
[16] **1**: 22. 1903.

he created for it a special family Echinodiaceae of uncertain affinity,[17] and also placed *Hypnodendron* in a very different part of his system.[18]

While on the subject of mosses with differentiated leaf margins, I was glad to note that Bartram in his excellent moss flora of the Hawaiian Islands[19] had removed from *Hypnodendron* the *H. tricostatum* (Sull.) Broth.,[20] as I had also done independently in notes on that genus taken in Geneva, Switzerland in 1934, and had restored it to the genus *Limbella* C. M. Bartram was however here following a better afterthought of Brotherus, who subsequent to his second edition, in 1927[21] had thus treated this species. *Limbella* is a genus of Carl Müller and seems to have been first mentioned by him as a section of *Hypnum*,[22] with the new species *Hypnum* (*Limbella*) *confluens* from Tierra del Fuego. The section was later by its author promoted to a genus.[23] But the species *confluens* is just one of those included by Brotherus in the real *Sciaromium* (section *Limbidium*), as are also at any rate most of the other species mentioned in this latter work. If Carl Müller in 1896[24] put the species *tricostata* in *Limbella*, he was of course not creating a new genus, but merely including this species in his already existing genus, so the dating of *Limbella* from 1896 by Brotherus is obviously wrong, *Limbella* is essentially a synonym of *Sciaromium* and could be retained as an independent genus only by some process of exclusion. The Hawaiian species appears in Paris as *Sciaromium tricostatum* (Sull.) Mitt. 1871.[24a] That this whole conglomeration of mosses with differentiated leaf margins, and some without them, most of which have been found only sterile, needs further study is too obvious to require special emphasis.

[17] **11:** 213 f. 1925.

[18] **10:** 436 ff. 1924. Brotherus had also prior to his second edition (Sitz.-ber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. I, Bd. **131:** 218. 1922) described a *Sciaromium sinense* from "Setschwan" (Szechwan), China, which appears in his second edition under the generic name *Sciaromiopsis* (proposed the year before in Sitz.-ber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. I, Bd. **133:** 580. 1924), with an additional species, which, judging from the rather crude illustrations, does not differ much from the first. One may also easily conjecture the identity of another genus of the second edition (**11:** 194, also proposed in the same paper of the year before (p. 575), *Handeliobryum*, also with 2 species, one from Sikkim, the other from "Setschwan," placed in a quite different part of the moss system. I haven't been able to find any particular differences in the descriptions and it may be noted that *Handeliobryum setschwanicum* and *Sciaromiopsis brevifolia* were collected by Handel-Mazzetti in the same locality the same day, differing only by 3 collection numbers (cf. Symbolae sinicae **4:** 89 and 102. 1929).

[19] Manual of Hawaiian Mosses 132. 1933.

[20] Ed. I: 1168; Ed. II, **10:** 438. 1924.

[21] Hawaiian Mosses 23.

[22] Flora **68:** 429. 1885.

[23] In his treatment of the mosses for Forschungsreise S. M. S. Gazelle in den Jahren 1874–76, published in Berlin 1889. This work is not accessible to me and I am dependent on Paris for citations from it.

[24] Flora **82:** 466.

[24a] *Sciaromium Fryei* Williams from Oregon (THE BRYOLOGIST **35:** 52, *pl. 5.* 1933) to judge from the description and figure is more suggestive of the *Limbella* type and at any rate hardly related to the eastern *S. Lescurii*.

To return to our *Sciaromium Lescurii* (Sull.) Broth., Kindberg with an acuteness which he didn't always show gave it a separate and appropriate name *Platyloma*,[25] the basis of Brotherus' section name, which should then in spite of a none too good description be accepted, unless someone can find it had been used earlier elsewhere in the plant world. I haven't discovered anything nearer than *Platyluma*. Grout has not included Kindberg's name, even as a synonym.

To sum up briefly: our species called *Sciaromium Lescurii* (Sull.) Broth. should rather be called *Platyloma Lescurii* (Sull.) Kindb., unless one is prepared to include it in an *Amblystegium* treated as broadly as was done by Lindberg.[26] Incidentally warning may be given that our European authorities were capable of mistakes,—a great many of them in fact—and that Brotherus in Engler-Prantl, while convenient in arranging one's herbarium, is much in need of careful revision.

ITHACA, N. Y.

THE ATRACHEATA (BRYOPHYTA) OF IOWA*
II. IOWA MOSSES IN PRINT: A CRITIQUE OF THE SPECIES REPORTED FOR THE STATE.

HENRY S. CONARD.

If one compares our list of "Species and their Geographic Distribution" (Part 1 of this series) with the published lists of Iowa mosses and liverworts, the discrepancies appear to be much more numerous than the agreements. It seems worth while to explain these discrepancies. Some remaining problems will thus be revealed. In other cases it will be shown that there is no problem at all. In general we have to do with synonymy (changes of names), misidentification, and missing specimens. Following is a list of all names published hitherto, and of some county records, not included in our list of species (Part 1), with the reasons for the omissions.

MUSCI

Acaulon rufescens Jaeg., Poweshiek Co., Cavanagh 1932 (1934) proves to be *A. triquetrum* (Spruce) C. M. Poweshiek Co., Cavanagh 1934 (1935) proves to be *A. rubrum* (Röhl.) Grout.

Amblystegiella adnata (Hedw.) Nichols is now *Homomallium adnatum* (Hedw.) Broth.

[25] Sp. European and North American Bryineae 79. 1896.
[26] Musci Scandinavici. 1879.
* Published with the aid of a grant from the Graduate Department, State University of Iowa.

Amblystegiella Sprucei (Bruch) Loeske, Dubuque Co., Conard 1932, seems to be that, but the mere shreds collected are too small to depend upon.

Ambystegiella subtilis (Hedw.) Loeske, Emmet Co., Blagg 1928, was wrongly identified (Conard & Wolden 1932).

Amblystegium adnatum (Hedw.) Aust. is now *Homomallium adnatum* (Hedw.) Broth.

Amblystegium brevipes Card. & Thér. is now *Leptodictyum brevipes* (C. & T.) Broth.

Amblystegium irriguum (Wils.) Bry. Eur. is now *Hygroamblystegium irriguum* (Wils.) Loeske.

Amblystegium Kochii Bry. Eur. is now *Leptodictyum trichopodium* var. *Kochii* (Bry. Eur.) Broth.

Amblystegium noterophilum (Sull.) Holz. is now *Hygroamblystegium noterophilum* (Sull.) Warnst.

Amblystegium orthocladon (P. B.) Kindb. is now *Hygroamblystegium orthocladon* (P. B.) Grout.

Amblystegium riparium (L., Hedw.) Bry. Eur. is now *Leptodictyum riparium* (L., Hedw.) Warnst.

Amblystegium serpens var. *radicalis* Aust.; Cavanagh (1930) cites *Hypnum radicale* Beauv. of Bessey 1884 as a synonym. Apparently this statement is based upon Lesquereux and James, p. 373. L. & J. give *Hypnum varium* Beauv. as another synonym of *H. radicale* Beauv. Doubtless Bessey's plant was the ubiquitous *Amblystegium varium* (Hedw.) Lindb. Nothing resembling *Campylium radicale* (P. B.) Grout (*Hypnum radicale* P. B.) has ever been seen in Iowa. Cf. Grout: "Moss Flora of North America" **3:** 70.

Amblystegium trichopodium (Schultz), cited by Conard 1932, is now *Leptodictyum trichopodium* (Schultz) Warnst.

Amblystegium trichopodium var. *Kochii* (Bry. Eur.), cited by Conard & Wolden 1932, is now *Leptodictyum trichopodium* var. *Kochii* (Bry. Eur.) Broth.

Amphidium californicum (Hampe) Broth., Dickinson Co., Cavanagh 1931 (1932), 1934, proves to be antheridial *Ceratodon purpureus* (Hedw.) Brid.

Anomodon obtusifolius Br. & Sch. is now *Anomodon minor* (Beauv.) Lindb.

Anomodon tristis (Cesati) Sull. is now *Haplohymenium triste* (Cesati) Kindb.

Anomodon viticulosus (Hedw.) H. & T., Henry Co., Blagg 1927, proves to be *A. attenuatus* (Hedw.) Hüben.

Anomodon viticulosus (Hedw.) H. & T., Winneshiek Co., Conard 1938, proves to be *A. minor* (Beauv.) Lindb. See Conard 1943a.

Astomum crispum (Hedw.) Hampe, Marion Co., Blagg 1930 (1931) proves to be *A. Muhlenbergianum* (Sw.) Grout. *A. crispum*, as now understood, does not occur in North America.

Astomum Sullivantii Schimp. is now *A. Muhlenbergianum* (Sw.) Grout.

Astomum nitidulum Schimp., Bessey 1884 and Johnson Co., Savage 1898, must prove to be *A. Muhlenbergianum* (Sw.) Grout. Andrews 1922 states that the type of *A. nitidulum*, from Ohio, is probably a hybrid of *A. Muhlenbergianum* and *Weisia viridula* Hedw. *A. nitidulum* is not now recognized as a valid species. See M. F. N. A. **1:** 152.

Barbula rigida Schultz is now *Aloina rigida* (Sch.) Kindb.

Bartramia Oederi (Gunn.) Swtz. is now *Plagiopus Oederi* (Brid.) Limpr.

Brachythecium acuminatum (Hedw.) Kindb. is now *Chamberlainia acuminata* (Hedw.) Grout.

Brachythecium acuminatum var. *rupincolum* S. & L., Story Co., Bessey 1884 and Cavanagh 1930 (1931), now in the genus *Chamberlainia*, has not been found in any herbarium.

Brachythecium acuminatum var. *setosum* S. & L., Johnson Co., Savage 1898. The variety is considered invalid by Grout (M. F. N. A. **3:** 28, under *Chamberlainia acuminata*).

Brachythecium acutum (Mitt.) Sull. Emmet Co., Wolden 1919; Poweshiek Co., Blagg 1929 (1930). We have seen the specimens referred to, but are unwilling to refer them to this species.

Brachythecium cyrtophyllum Kindb. is now *Chamberlainia cyrtophylla* (Kindb.) Grout.

Brachythecium digastrum C. M. & K., Emmet Co., Blagg 1928; this and several other specimens have been examined, but we are unwilling to refer them to this species.

Brachythecium laetum Brid. is now *B. oxycladon* (Brid.) J. & S.

Brachythecium oxycladon var. *dentatum* (L. & J.) Grout, Boone Co., Blagg 1929 (1930). The variety is certainly common throughout the State. The species is so very variable and abundant that we are not prepared to discuss the matter now.

Brachythecium plumosum (Sw.) Bry. Eur. is now *B. flagellare* (Hedw.) Jenn.

Bryhnia graminicolor var. *Holzingeri* (R. & C.) Grout, Dubuque Co., Conard 1932, probably should be referred directly to the species.

Bryhnia novae-angliae (S. & L.) Grout, Fayette Co., Blagg 1928a, 1928b, is *Eurhynchium hians* (Hedw.) J. & S.

Bryhnia novae-angliae (S. & L.) Grout, Clayton Co., Cavanagh 1929, is the same species.

Bryum affine (Bruch) Lindb. is now referred to *B. cuspidatum* (Bry. Eur.) Schimp., the other name being invalid (Andrews: M. F. N. A. **2:** 230).

Bryum argenteum var. *lanatum* (Beauv.) Bry. Eur. doubtless occurs frequently throughout the State, but we have not critically sorted the collections.

Bryum bimum Schreb. is here referred to *B. pseudotriquetrum* (Hedw.) Schw. See Andrews in M. F. N. A. **2:** 231–32, and Grout, l. c. p. 266.

Bryum inclinatum (Sw.) B. & S., Emmet Co., Wolden 1919, et al., is not that species. Cf. Conard & Wolden 1932, p. 4.

Bryum intermedium Brid., as now understood, does not occur in North America. The specimens so named are usually *B. cuspidatum* (Bry. Eur.) Schimp. See Andrews in M. F. N. A. **2:** 230.

Bryum nutans Schreb. is now *Pohlia nutans* (Hedw.) Lindb.

Calliergon cuspidatum (L.) Kindb. is now *Calliergonella cuspidata* (Brid.) Loeske.

Calliergon Schreberi (Willd.) Grout is now *Calliergonella Schreberi* (Bry. Eur.) Grout.

Campylium radicale (Beauv.) Grout, Emmet Co., Blagg 1928 is not that species. See *Amblystegium varium.*

Catharinea angustata Brid. is now *Atrichum angustatum* (Brid.) Bry. Eur.

Catharinea crispa James is now *Atrichum crispum* (James) Sull.

Catharinea Macmillani Holz. is now *Atrichum Macmillani* (Holz.) Frye.

Catharinea undulata (L.) W. & M. is now *Atrichum undulatum* (Hedw.) Beauv.

Catharinea undulata var. *altecristata* (R. & C.) Cavanagh 1931 (1932) is now *Atrichum undulatum* var. *Selwynii* (Aust.) Frye.

Ceratodon purpureus var. *aristatus* Aust., Cerro Gordo Co., Savage 1898. The specimen is better referred directly to the species.

Climacium Kindbergii (R. & C.) Grout, Fayette Co., Blagg 1927 and Clayton Co., Cavanagh 1932 (1934) are *C. americanum* Brid.

Cylindrothecium cladorrhizans Schimp. is now *Entodon cladorrhizans* (Hedw.) C. M.

Cylindrothecium compressum B. & S. is now *Entodon compressus* (Hedw.) C. M.

Cylindrothecium seductrix Sull. is now *Entodon seductrix* (Hedw.) C. M.

Desmatodon arenaceus S. & L. is now *Desmatodon obtusifolius* (Schw.) Jur.

Dicranum pallidum B. & S. is now *D. condensatum* Hedw.

Didymodon luridus Hornsch. is now *D. trifarius* (Hedw.) Brid.

Didymodon luridus var. *cuspidatus* Schimp., Cavanagh 1929, proves to be *Barbula unguiculata* Hedw.

Didymodon rubellus (Hoffm.) B. & S. is now *Didymodon recurvirostris* (Hedw.) Jenn.

Ditrichum tortile (Schrad.) Hampe is now *D. pusillum* (Hedw.) E. G. B.
Drepanocladus revolvens var. *intermedius* (Lindb.) Grout is now *D. intermedius* (Lindb.) Warnst. But Wynne (1944) says it is not more than a "form" of *D. revolvens*.
Drepanocladus vernicosus (Lindb.) Warnst., Blagg 1928, is not that species. See Conard & Wolden 1932.
Entodon seductrix var. *minor* (Aust.) Grout, Dickinson Co., Cavanagh 1931 (1932) proves to be *E. compressus* (Hedw.) C. M. Drexler (1940) has found var. *tenuis* in Linn Co.
Ephemerum sessile (B. & S.) C. M., Dickinson Co., Shimek 1915, was not found in the packet so labeled. Grout, M. F. N. A. 2: 69, says "No American specimens have been located."
Eurhynchium strigosum (Hoffm.) Bry. Eur., Blagg 1927, 1929, proves to be the var. *robustum* Röll, or some other species.
Fabroleskea Austinii (Sull.) Best is now *Lindbergia brachyptera* (Mitt.) Kindb. var. *Austinii* (Sull.) Grout.
Fabronia gymnostoma S. & L., Dickinson Co., Cavanagh 1931 (1932) proves to be *F. ciliaris* (Brid.) Brid., with the peristome broken off.
Fabronia iowensis Cavanagh 1934, n. sp., is based on the specimen which in 1931 (1932) was called *F. gymnostoma*. The plant is *F. ciliaris*. The new name is invalid because there is no diagnosis in Latin; and it is a synonym.
Fabronia octoblepharis (Schl.) Schw. is now *F. ciliaris* (Brid.) Brid.
Fissidens adiantoides (L.) Hedw., Emmet Co., Blagg 1927 (1928), is not that species. See Conard & Wolden 1932.
Fissidens bryoides Hedw. of Bessey 1884 and Blagg 1930 (1931) is not that species.
Fissidens incurvus Schw. as it occurs in Iowa is now referred to *F. minutulus* Sull.
Fissidens incurvus var. *exiguus* Aust. is now *F. exiguus* Sull.
Fissidens incurvus var. *minutulus* Aust. is now *F. minutulus* Sull.
Fissidens osmundioides (Swtz.) Hedw. as reported from Iowa always proves to be something else.
Fissidens viridulus (W. & M.) Wahlenb., Conard 1938 is not that species.
Fontinalis Lescurii Sull., Emmet Co., Blagg 1927 (1928) and Conard & Wolden 1932, proves to be *F. Duriaei* Schimp.
Funaria hygrometrica var. *calvescens* (Schw.) Bry. Eur. is now *F. calvescens* Schw.
Georgia pellucida (L.) Rabenh. is now *Tetraphis pellucida* Hedw.
Grimmia glauca Card., Lyon Co., Blagg 1930 (1931), is better referred to *G. laevigata* (Brid.) Brid.
Grimmia leucophaea Grev. is now *G. laevigata* (Brid.) Brid.
Grimmia pennsylvanica Schw. is now *G. pilifera* Beauv.
Gymnostomum curvirostre (Ehrh.) Hedw. is now *G. recurvirostrum* Hedw.
Gymnostomum tenue Hedw. is now *Gyroweisia tenuis* (Hedw.) Schimp.
Harpidium aduncum Hedw. is now *Drepanocladus aduncus* (Hedw.) Warnst.
Hedwigia albicans (Web.) Lindb. is now *H. ciliata* Hedw.
Hylocomium proliferum (L.) Lindb. is now *H. splendens* (Hedw.) Bry. Eur.
Hylocomium Schreberi Willd. is now *Calliergonella Schreberi* (Bry. Eur.) Grout.
Hylocomium triquetrum (L.) B. & S. is now *Rhytidiadelphus triquetrus* (Hedw.) Warnst.
Hypnum acuminatum var. *rupincolum* S. & L. See *Brachythecium acuminatum* var. *rupincolum*.
Hypnum aduncum Hedw. is now *Drepanocladus aduncus* (Hedw.) Warnst.
Hypnum arcuatum var. *elatum* (Schimp.) is now *Hypnum Patientiae* Lindb. var. *elatum* Schimp.
Hypnum delicatulum L. is now *Thuidium delicatulum* (Hedw.) Mitt.
Hypnum fluitans L., Dickinson Co., Shimek 1915 proves to be *Drepanocladus aduncus* (Hedw.) Warnst. Doubtless the same is true for Pammel 1909.

D. fluitans has never been found alive in Iowa, whereas *D. aduncus* is common in suitable places.

Hypnum Haldanianum Grev. is now *Heterophyllium Haldanianum* (Grev.) Kindb.

Hypnum imponens Hedw., Johnson Co., Savage 1898, proves to be *H. curvifolium* Hedw. *H. imponens* has been found in Pine Hollow, Dubuque Co. and in Jones Co.

Hypnum laetum Brid. is now *Brachythecium oxycladon* (Brid.) J. & S.

Hypnum radicale Beauv. of Bessey 1884 is now *Amblystegium varium* (Hedw.) Lindb.

Hypnum recurvans (Mx.) Schw. is now *Brotherella recurvans* (Mx.) Fleisch.

Hypnum serpens Linn. is now *Amblystegium serpens* (Hedw.) Bry. Eur.

Hypnum tamariscinum Hedw. of Pammel 1905 is presumably *Thuidium delicatulum* (Hedw.) Mitt.

Leptodictyum riparium f. *longifolium* (Schultz) Grout, Conard 1938, should be called *L. riparium* f. *flaccidum* (L. & J.) Grout.

Leskea Austinii Sull. is now *Lindbergia brachyptera* var. *Austinii* (Sull.) Grout.

Leskea polycarpa var. *paludosa* (Hedw.) Schimp., Emmet Co., Blagg 1928, is not that variety.

Leucobryum vulgare Hampe is now *L. glaucum* (Hedw.) Schimp.

Mniobryum albicans (Wahlenb.) Limpr. is now *Pohlia Wahlenbergii* (W. & M.) Andr.

Mniobryum carneum (L.) Limpr. is now *Pohlia delicatula* (Hedw.) Grout.

Mnium Drummondii Bry. Eur. Fayette Co., Blagg 1928, proves to be not that species.

Mnium hornum L., Clayton Co., Cavanagh 1929, proves to be *M. serratum* Brid.

Mnium marginatum (Dicks.) P. Beauv. is now *Mnium serratum* Brid.

Mnium rostratum Schrad. is now *M. longirostrum* Brid.

Mnium spinulosum Bry. Eur. Of several specimens purporting to be this species we are at present unwilling to accept any.

Neckera pennata var. *oligocarpa* (Bruch) Grout. A collection of this in the Herbarium of the State University of Iowa was taken from a white cedar (*Thuja occidentalis*) railroad tie at Sioux City, Iowa. Doubtless it had been recently hauled in from northern Minnesota or Wisconsin and did not survive.

Orthotrichum brachytrichum Schimpr. is now *O. pumilum* Dicks.

Orthotrichum Braunii Bry. Eur. is now *O. stellatum* Brid.

Orthotrichum cupulatum (Hoffm.) Brid., Dubuque Co., Cavanagh 1929, proves to be *O. strangulatum* Schw.

Orthotrichum Porteri Aust. is now *O. strangulatum* Schwaegr. (not of Sullivant).

Orthotrichum pusillum Mitt., Johnson Co., Cavanagh 1929, is not that species.

Orthotrichum Schimperi Hamm. is now *O. pumilum* Dicks.

Orthotrichum sordidum S. & L. or L. & J., Mahaska Co., Blagg 1929 (1930), is *O. pumilum* Dicks.

Orthotrichum strangulatum Sulliv. and of Beauv. in L. & J. Manual is now *O. stellatum* Brid.

Phascum cuspidatum Schreb. in Iowa is the var. *americanum* R. & C. only.

Phascum Floerkeanum W. & M., Dickinson Co., Cavanagh 1931 (1932), is something else. The species is not known from North America (See M. F. N. A.).

Philonotis radicalis (P. Beauv.) Brid. is now *P. longiseta* (Rich.) E. G. B.

Physcomitrium acuminatum (Schl.) Bry. Eur. as found in Iowa is better referred to *P. turbinatum* (Mx.) Brid.

Physcomitrium Drummondii E. G. B. is now *P. Kellermani* E. G. B. var. *Drummondii* (E. G. B.) Grout.

Physcomitrium pyriforme of American authors is not the species so named by Bridel, but is *P. turbinatum* (Mx.) Brid.

Platygyrium repens var. *ascendens* (Schw.) Grout, Dubuque Co., Conard 1932, is too doubtful to include.

Pleuridium alternifolium (Kaulf.) Rabenh. is now *P. subulatum* (Hedw.) Lindb.

Pleuridium palustre (B. & S.) Bry. Eur., Dickinson Co., Cavanagh 1931 (1932), 1934, was not found in a packet so labeled.

Pogonatum brevicaule Beauv. is now *P. pensilvanicum* (Hedw.) Paris.

Pohlia Lescuriana (Sull.) Grout is now *P. pulchella* (Hedw.) Lindb.

Pohlia proligera Lindb. is not a synonym for *P. annotina* var. *decipiens* Loeske (See Conard 1938), but the former name has often been wrongly used for the plant properly called by the latter name.

Polytrichum gracile Smith, Dickinson Co., Cavanagh 1931 (1932), proves to be *P. commune* Hedw.

Pottia littoralis Mitt., Dickinson Co. Cavanagh 1931 (1932), 1934, proves to be *P. Randii* Kenn.

Pottia truncatula (L.) Lindb. as reported for Iowa proves always to be something else.

Pylaisia intricata B. & S. of Savage 1898 proves to be *P. Selwynii* Kindb. Doubtless the same is true for Bessey 1884.

Pylaisia polyantha Bry. Eur. as reported for Iowa always proves to be something else.

Pylaisia Schimperi R. & C. is now *P. Selwynii* Kindb.

Pylaisia velutina B. & S. This name is now cited as a synonym of *P. intricata* (Hedw.) Bry. Eur., based upon a study of Hedwig's type. The plant which Schimper used in preparation of Bry. Eur. and which he called *P. intricata* is the one we now call *P. Selwynii*. Bessey 1884 lists *P. polyantha* B. & S., *P. intricata* B. & S. and *P. velutina* B. & S., all on trees or logs. Without his specimens it is impossible to tell what he had.

Raphidostegium carolinianum (C. M.) J. & S. is now *Sematophyllum carolinianum* (C. M.) E. G. B.

Rhodobryum ontariense Kindb. is now *Rhodobryum roseum* (Bry. Eur.) Limpr.

Rhynchostegium serrulatum Hedw. is now *Eurhynchium serrulatum* (Hedw.) Kindb.

Saelania caesia Lindb., Muscatine Co., Cavanagh 1932 (1934), proves to be a tall growth of *Ditrichum pusillum* (Hedw.) E. G. B.

Seligeria recurvata (Hedw.) Bry. Eur., Dubuque Co., Cavanagh 1929, cannot be found. The specimen so labeled is *S. pusilla* (Hedw.) Bry. Eur.

Sphagnum cuspidatum Ehrh., Muscatine Co., Cavanagh 1929 cannot at present be verified.

Sphagnum medium Limpr. is now *S. magellanicum* Brid. The Muscatine Co. specimen, Cavanagh 1929, has not been verified.

Swartzia montana (Lam.) Lindb. is now *Distichium capillaceum* (Hedw.) Bry. Eur.

Thuidium gracile B. & S., Muscatine Co., Savage 1898, proves to be *T. virginianum* (Brid.) Lindb. Cavanagh 1930 (1931) criticizes Blagg 1927 (1929) for using the above synonymy, saying, p. 99, "*Thuidium gracile* B. & S. is given as *T. virginianum* (Brid.) Lindl., which is a synonym for *T. gracile* var. *lancastriensis* S. & L.; but Savage did not have the variety, and this form should appear under the name *T. microphyllum* (Sw.) Best." Miss Cavanagh is right on the synonymy, though two lapses calami appear: S. & L. wrote *lancastriense*, correctly; and the authority for *T. virginianum* is Lindb. Savage's specimens are *T. virginianum*.

Thuidium scitum (Beauv.) Aust., Johnson Co., Savage 1898, proves to be *T. minutulum* (Hedw.) Bry. Eur.

Timmia cucullata Mx. is now *T. megapolitana* f. *cucullata* (Rich.) Sayre. Both the species and the form occur widely in Iowa. We have not critically distinguished them. Miss Cavanagh (unpublished) detected in the University Herbarium two collections with smooth cilia. These should be studied.

Tortella caespitosa (Schw.) Limpr. is now *T. humilis* (Hedw.) Jenn.
Ulota americana (Beauv.) Limpr., Fayette Co., Blagg 1930 (1931), proves to be *Orthotrichum strangulatum* Schw. The Dickinson Co. material of Conard & Wolden 1932 proves to be *O. anomalum* Hedw.
Weisia viridula var. *crispata*, attributed to "C. M.", Blagg 1928 (1929) must be the species itself. And I cannot find any other authority for the name! There is a European *W. crispata* (Nees & Hornsch.) C. M., which has been reported for Mo. and Minn., by mistake. See M. F. N. A. 1: 156.

HEPATICAE

Aneura pinguis (L.) Dum. is now *Riccardia pinguis* (L.) S. F. Gray.
Asterella hemisphaerica Beauv. is now *Reboulia hemisphaerica* (L.) Raddi.
Cephalozia multiflora Spruce is now *C. media* Lindb.
Cephaloziella divaricata (Sm.) Schiffn., Jasper Co., Blagg 1930 (1931), is now referred to *C. byssacea* (Roth) Warnst.
Conocephalus conicus Dumort. is now *Conocephalum conicum* (L.) Dum. The spelling *Conocephalum* is credited to Weber in Wiggers Prim. Fl. Holsat. in the year 1780, when the name was first invented. Necker in 1791 used "*Conocephalus*," and Dumortier used "*Conocephalus conicus*" in 1822 when this combination of genus and species names was first put together. We now return to the original spelling of the genus name, and we make the species name (adjective) agree in gender with the generic name (noun). The genus-name *Fegatella* was proposed by Raddi in 1818, and "*Fegatella conica*" was put together by Corda in 1829. This name has been very widely used. There is a genus *Conocephalus* in the mulberry family, with about 10 species of woody vines, in the East Indies and Malaysia.
Frullania aeolitis Nees is now *F. riparia* Hampe.
Frullania virginica Lehm. is now *F. eboracensis* Gottsche.
Grimaldia barbifrons Bisch. is now *Mannia fragrans* (Balb.) Frye & Clark., not *M. rupestris* as assumed by Drexler 1942.
Jungermannia Schiffneri (Loitelsb.) Evans of Conard: Check List proves to be *Jamesoniella autumnalis* (DC.) Steph.
Jungermannia ventricosa Dicks. of Shimek 1898 has not been found in any collection. An envelope with this label, evidently the one cited from Muscatine Co., contains *Lophocolea heterophylla*.
Lejeunea serpyllifolia var. *americana* Lindb., Johnson Co., Fitzpatrick & Fitzpatrick 1897, has not been seen. It may have been *Radula complanata* or a *Frullania* with explanate underlobes.
Madotheca platyphylla Dum. is now *Porella platyphylla* (L.) Lindb. Bessey 1884 probably had *P. platyphylloidea* (Schw.) Lindb.
Plectocolea crenulata var. *gracillima* (Sm.) of Conard 1942 is now believed to be *Odontoschisma prostratum* (Sw.) Trevis.
Ptilidium ciliare Nees, "Iowa City; not rare," Shimek 1898, must be *P. pulcherrimum* (Web.) Hampe, the only species now known in Iowa. Shimek's specimen has not been found.
Riccia crystallina L. from Iowa proves to be *R. Beyrichiana* Hampe. We have not seen the specimens of Fitzpatrick & Fitzpatrick 1897.
Riccia glauca L. of Bessey 1884 was probably *R. Beyrichiana* Hampe.
Riccia lutescens Schw. is the land form of *Ricciocarpus natans* (L.) Corda.
Ricciella fluitans A. Braun is now *Riccia fluitans* L.
Sphenolobus exsectiformis (Breidl.) Steph. is now *Tritomaria exsectiformis* (Breidl.) Schiffn.
Sphenolobus exsectus (Schmid.) Steph. is now *Tritomaria exsecta* (Schmid.) Schiffn.

ANTHOCEROTAE

Anthoceros punctatus var. *crispulus* Mont. is now *A. crispulus* (Mont.) Douin.
Notothylas melanospora Sull. is now *N. orbicularis* (Schwein.) Sull.

MOSSES OF MOROBE DISTRICT, NORTHEAST NEW GUINEA*

EDWIN B. BARTRAM

Little by little the moss flora of New Guinea is being pieced out but the area is so large and inaccessible and the flora so astonishingly rich that it may be many years before any adequate idea of its extent and affinities can be determined. Mrs. Clemens' collections from the Morobe District in the extreme eastern corner of Northeast New Guinea open up an entirely new region and very naturally contain many new and surprising additions to the island flora. At the higher subalpine levels the occurrence of such austral species as *Distichium capillaceum, Dicranoloma Billardieri, Triquetrella papillata, Rhizogonium distichum, Zygodon sulcatus, Ulota angusti-limbata* and *Drepanocladus fluitans* emphasize again the close connection between the alpine mosses of New Guinea and those of Australia and New Zealand. On the other hand a significantly large group of species found on the lower slopes are typical of the regions to the north and west indicating that to some extent this flora has had its origin in the opposite direction. Mrs. Clemens' collections represent a total of 116 species in which 68, or more than half, are known from the East Indies and the Philippines. Speculation is rather useless in the absence of more conclusive data but it is not illogical to suppose that the moss flora of the northeast coast has been derived to a large extent from the regions to the west and northwest.

I am indebted to the University of Michigan for the privilege of studying this important collection and a full series of specimens including the co-types of the new species has been deposited in their herbarium while a duplicate set is in the herbarium of the author.

SPHAGNACEAE

SPHAGNUM JUNGHUHNIANUM Doz. & Molk.

Matap, elev. 5000–6000 ft., *No. 41045.*

FISSIDENTACEAE

FISSIDENS FILICINUS Doz. & Molk.

(*Fissidens nobilis* Griff.)

A-mieng (A-mien), on Yaneng (Yanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft., *No. 12229.11.*—Bona, elev. 2500–4500 ft., *No. 41555.9.*

* Published with the aid of a grant from the Horace H. Rackham Fund of the University of Michigan.

DITRICHACEAE

DISTICHIUM CAPILLACEUM (Hedw.) Bry. Eur.

Rawlinson Range, elev. 7000–12000 ft., *No. 12445B.14.*

DICRANACEAE

Campylopus (Palinocraspis) morobensis Bartr. sp. nov.

Gracilis, caespitosus, caespitibus laxis, fuscescenti-viridibus. Caulis haud tomentosus, ramosus, laxe et interrupte foliosus. Folia sicca et humida flexuosa, ad 7 mm. longa, e basi ovata, concava, sensim longe lineari-laneolata, canaliculata, subulato-acuminata; margines erecti, superne tantum minute serrulati; costa excurrente, basi circa dimidiam partem folii occupante; cellulae basilares oblongae, incrassatae, margines versus sensim angustiores, alares hyalinae vel fuscae, superiores rhomboideae, incrassatae. Caetera ignota.

Matap, elev. 5000–6000 ft., *No. 11290.1a.*

Very similar in many respects to *C. filifolius* (Hornsch.) Mitt. of the american tropics. The Section Palinocraspis is sparsely represented in the southwest Pacific so that this is a noteworthy collection.

CAMPYLOPUS UMBELLATUS (W. Arn.) Bartr.

Matap, elev. 5000–6000 ft., *Nos. 11297.1; 11316.3.*

DICRANODONTIUM NITIDUM (Doz. & Molk.) Fleisch.

Rawlinson Range, elev. 7000–12000 ft., *Nos. 12445B.10; 12503.12.*

CRYPTODICRANUM ARMITI (C. M.) Bartr.

A-mieng (A-mien), on Yaneng (Yanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft., *No. 12242.6.*

CRYPTODICRANUM ARMITI (C. M.) Bartr. var. **fragilifolium** Bartr. var. nov. Folia fragilissima.

A-mieng (A-mien) on Yaneng (Yanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft., *No. 12229.12.*

The very fragile leaves with the points nearly always broken off more than half way down give these plants a characteristically different appearance from the typical form.

DICRANOLOMA PERARMATUM Broth.

Wantoat, No. 41184.3.

Previously known only from the Philippines.

DICRANOLOMA BILLARDIERI (Schwaegr.) Par.

Matap, elev. 5000–6000 ft., *No. 11290.1.*

These plants are sterile but as far as the vegetative characters are concerned they differ in no material way from *D. Billardieri.*

DICRANOLOMA BRAUNII (C. M.) Par.

Rawlinson Range, elev. 7000–12000 ft., *Nos. 12503.5; 12503.13.*—Bona, elev. 2500–4500 ft., *Nos. 41521.2; 41556.*

DICRANOLOMA BLUMII (Nees) Par.

Matap. elev. 5000–6000 ft., *Nos 41046; 11242a.*—Bona, elev. 2500–4500 ft., *No. 12242.8.*—Wantoat, *No. 41184.4.*

DICRANOLOMA NOVA-GUINENSE (Broth. & Geh.) Par.

Wantoat, No. *41184a.*

DICNEMONACEAE

Dicnemon robustum Bartr. sp. nov.

Robustum fuscum, nitidum. Caules ad 10 cm. alti, simplices vel sparse ramosi, inferne sparse tomentosi. Folia late patentia, magna, 9–10 mm. longa, 2.5–3 mm. lata, ovato-lanceolata, superne transverse rugosa; margines integri, involuti; costa tenuissima, sub apice dissoluta; cellulae elongatae, incrassatae, porosae, margines versus angustiores, ad insertionem aurantiaceae, alares pernumerosae, subquadratae, hyalinae, parietibus firmis. Fructus ignotus.

Rawlinson Range, elev. 7000–12000 ft., *No. 12493.*

A clearly marked, unusually robust species differing from *D. rugosum* (Hook.) Schwaegr. and *Dicnemon undulatifolius* Dix. in the very slender costa ending below the apex. *D. calycinum* (Hook.) Schwaegr. is a much smaller plant with shorter leaves and different alar cells.

LEUCOBRYACEAE

LEUCOBRYUM JAVENSE (Brid.) Mitt. form.

A-mieng (A-mien), on Yaneng (Yanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft., *Nos. 12229.8; 12242.5.*

Both of these collections represent a rather marked form with the leaves erect-spreading instead of falcate-secund and less strongly rugose on the back above. Otherwise the leaf structure is typical.

LEUCOPHANES CANDIDUM (Hornsch.) Lindb.

Wonimbu-Galumbu, No. 41254.4.—Bona, elev. 2500–4500 ft., *No. 41890.8.*

EXODICTYON BLUMII (C. M.) Fleisch.

Bona, elev. 2500–4500 ft., *Nos. 41521.1; 41899.4.*

CALYMPERACEAE

SYRRHOPODON GARDNERI (Hook.) Schwaegr.

Matap, elev. 4000–5000 ft., *No. 41215.6.*

CALYMPERES PORRECTUM Mitt.

Calymperes salakense Besch.

Bona, elev. 2500–4500 ft., *Nos. 41498.2; 41522.*

POTTIACEAE

Anoectangium magnirete Bartr. sp. nov.

Tenellum, dense caespitosum, caespitibus fuscescenti-viridibus. Caulis circa 1 cm. altus, simplex. Folia conferta, sicca spiraliter contorta, humida erecto-patentia, ad 1.4 mm. longa, carinato-concava, lineari-lanceolata, acuta; margines erecti, papilloso-crenulati; costa subpercurrens, dorso superne papillosa; cellulae superiores rotundato-quadratae, diam. 10–13 μ, dense verrucosae, vix incrassatae, infimae breviter rectangulares, leniter papillosae. Caetera ignota.

Galumbu, elev. 4500 ft., *No. 41257.15.*

Near *A. subclarum* Broth. of the Philippines but distinct in the larger, scarcely incrassate and more coarsely papillose lamina cells.

HYMENOSTYLIUM RECURVIROSTRUM (Hedw.) Dix.

Wanimbu—Galumbu, *No. 41254.*—Galumbu, elev. 4500 ft., *No. 41257.13.*

TRIQUETRELLA PAPILLATA (H. f & W.) Broth.

Rawlinson Range, elev. 7000–12000 ft., *No. 12503.8.*

The collection is scant and sterile having been segregated from other mosses but the plants are certainly referable to *Triquetrella.*

The leaves are strongly squarrose-recurved when moist suggesting that the plants may be specifically distinct from *T. papillata* but the material is too meagre upon which to base a new species.

Tortula novo-guinensis Bartr. sp. nov.

Species T. carolinianae Andrews valde affinis sed cellulis laminalibus laevibus dignoscenda.

Wantoat, Morobe District, *No. 41183.2.*

Had this collection come from Mexico or Central America I should have referred it to *T. caroliniana* without much hesitation as some of the tropical American material shows the leaf cells only faintly papillose but the wide leap in geographical distribution is a factor that cannot be lightly ignored. Apart from the smooth lamina cells the similarity is uncomfortably close.

BRYACEAE

BRACHYMENIUM NEPALENSE Hook.

Matap, elev. 5000–6000 ft., *Nos. 11326.5; 11334 bis.3.*

BRACHYMENIUM NEPALENSE Hook. var. **globosum** Bartr. var. nov.

Theca breviora, subglobosa, oculo nudo jam dignoscenda.

Matap, elev. 5000–6000 ft., *Nos. 11297.4; 11297.8; 11326.1* type; *41215.4.*—Wantoat, *No. 10997D.*

B. nepalense is a widely distributed species varying considerably in the length of the seta but with the capsules typically narrowly pyriform in shape. Here the capsules are nearly globose and abruptly narrowed to a slender neck.

POHLIA ELONGATA Hedw.

Rawlinson Range, elev. 7000–12000 ft., *No. 12445B.11.*

BRYUM CORONATUM Schwaegr.

Vicinity of Kajabit Mission, elev. 800–2000 ft., *No. 10708M.*—Wantoat, *No. 11190 bis.*

Bryum perrevolutum Bartr. sp. nov.

Rufescens, dense caespitosum. Caulis circa 6 mm. altus. Folia conferta, sicca erecta, imbricata, humida erecto-patentia, ovato-lanceolata, acuminata, ad 2 mm. longa, integerrima; margines fere ad apicem arcte revoluti; costa crassa, rubra, inferne ad 100 μ lata, in aristam rubram subintegram excurrens; cellulae superiores rhomboideae, parietibus tenuis, marginales vix angustiores, basilares breviter rectangulares, infimae rubrae. Seta circa 3 cm. alta, purpurea; theca subpendula, ovalis, 2 mm. longa, abrupte brevicolla; exostomii dentes vix 0.5 mm. longa, inferne fusca. Caetera ignota.

Rawlinson Range, elev. 7000–12000 ft., *No. 12445B.5.*

The capsules are too young to show the structure of the endostome but it seems likely that the species belongs in the Sec. *Eubryum.* I know of no other species from New Guinea or Malaysia with which it might be compared. The strongly revolute leaf margins and the strong, thick, excurrent costa are notable features.

RHODOBRYUM GIGANTEUM (Hook.) Schp.

A-mieng (A-mien) on Yaneng (Yanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft., *No. 12229.3.*

RHODOBRYUM RUSSULUM (Broth. & Geh.) Par.

Matap, elev. 5000–6000 ft., *No. 11296.*

LEPTOSTOMACEAE

LEPTOSTOMUM INTERMEDIUM Broth. ?

Rawlinson Range, elev. 7000–12000 ft., *No. 12503.4.*

The determination is questionable as the collection is without fruit.

RHIZOGONIACEAE

RHIZOGONIUM DISTICHUM (Sw.) Brid.

Rawlinson Range, elev. 7000–12000 ft., *No. 12445B.6.*

RHIZOGONIUM SPINIFORME (Hewd.) Bruch.

Bona, elev. 2500–4500 ft., *No. 41521; 41555.12.*

HYPNODENDRACEAE

SCIADOCLADUS NOVAE-GUINEAE Dix.

Bona, elev. 2500–4500 ft.

HYPNODENDRON DIVERSIFOLIUM Broth. & Geh.

Matap, elev. 5000–6000 ft., *No. 11290.3.*—Wantoat, *No. 41184.6.*

MNIODENDRON DIVARICATUM (Hornsch. & Reinw.) Lindb.

Bona, elev. 2500–4500 ft., *No. 41742.6.*

MNIODENDRON FUSCO-MUCRONATUM (C. M.) Broth.

Bona, elev. 2500–4500 ft., *No. 41867.*

Previously known only from the Philippines.

BARTRAMIACEAE

PHILONOTIS SECUNDA (Doz. & Molk.) Bryol Jav.

A-mieng (A-mien), on Yaneng (Yanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft., *No. 12242.2.*

SPIRIDENTACEAE

SPIRIDENS LONGIFOLIUS Lindb.

Matap, elev. 5000–6000 ft., *Nos. 11290; 11317b.*—Wantoat, *No. 41817.4.*

ORTHOTRICHACEAE

ZYGODON REINWARDTII (Hornsch.) Al. Br.

Bona, elev. 2500–4500 ft., *No. 41867.2.*—Rawlinson Range, elev. 7000–12000 ft., *No. 12445B.8.; 12493.2.*

ZYGODON SULCATUS (Knight) Dix.

Rawlinson Range, elev. 7000–12000 ft., *No. 12445B.7.*

Ulota angusti-limbata Bartr. sp. nov.

Autoica, pulvinata, pulvinulis lutescentibus, intus fuscescentibus. Folia sicca crispa, humida patentia, e basi obovata abrupte linearilanceolata, breviter acuminata, ad 3 mm. longa; marginibus erectis, eroso-denticulatis; costa sub apice evanida; cellulae superiores valde incrassatae, rotundatae, papillosae, lumine rotundato, basilares internae lumine angustissime lineari, externae in seriebus 1–2 subquadratae, pellucidae, parietibus incrassatis. Seta 7–9 mm. longa; theca sicca oblonga, plicata, humida ovalis, abrupte brevicolla. Caetera ignota.

Rawlinson Range, elev. 7000–12000 ft., *No. 12445B.1.*

Although near *U. lutea* Mitt. this species differs in a number of important particulars. The leaf base shows a very narrow marginal band of short, pellucid cells in 1 or 2 rows in contrast to 4 or 5 rows in *U. lutea;* the setae are longer and the capsules contracted to a very short neck instead of tapering to a long neck as in *U. lutea.* Unfortunately the fruit is too old to show the structure of the endostome.

MACROMITRIUM ORTHOSTICHUM Nees.

Matap, elev. 5000–6000 ft., *Nos. 11326.3; 11334 bis; 11297.3.*—Galumbu, *No. 41257.5.*—Wantoat, *No. 41207.*

MACROMITRIUM LONGICAULE C. M.

Galumbu, elev. 4500 ft., *Nos. 41257.3; 41257.4.*—Matap, elev. 5000–6000 ft., *Nos. 11254.1; 11326.2.*—Bona, elev. 2500–4500 ft., *Nos. 41555.7; 417142.4.*—A-mieng (A-mien), on Yaneng (Yanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft., *No. 12229.10.*

Macromitrium (Goniostoma) sublongicaule Bartr. sp. nov.

Robustum, ferrugineum, haud nitidum. Ramis ad 4.5 cm. altus, simplex vel dichotome ramulosis, dense foliosus. Folia 5–6 mm. longa, sicca contorta, humida flexuoso-patentia, e basi ovata sensim lineari-lanceolata, longe et tenuiter acuminata; margines integri; costa percurrens; cellulae superiores quadratae vel breviter rectangulares, papilla media instructa, parietibus firmis, pellucidis, basilares lineares, tuberculosae. Seta 4 mm. longa, laevis; theca oblongo-elliptica, sicca ore leniter angulato; peristomium simplex, dentes ad 180 μ longi, truncati, opaci; calyptra sparse pilosa.

Jan. 1940, *No. 40860* type.—Bona, elev. 2500–4500 ft., *No. 12242.7.*

A conspicuous, attractive species with the long, densely foliate branches bristling on all sides with the divergent, slender, fragile leaf points. In many respects the plants resemble *M. longicaule* C. M. but the plicate capsule mouth, the long, slender, fragile leaf points and the larger upper leaf cells seem to be clearly distinctive.

Macromitrium (Leiostoma) morobense Bartr. sp. nov.

Species M. sulcato (Hook.) Brid. affinis sed cellulis laminalibus multo majoribus, alte unipapillosis dignoscenda.

Rawlinson Range, elev. 7000–12000 ft., *Nos. 12445B.4; 12445B.13; 12448* type; *12503.3.*

While similar in size and appearance to *M. sulcatum* (Hook.) Brid. the New Guinea plants are sharply distinct in a number of noteworthy particulars. The upper leaf cells are much larger, often to 18 μ long and strongly unipapillate. Furthermore the area of lax, smooth juxta-costal cells in the leaf base, so characteristic of *M. sulcatum,* is here conspicuously absent.

Macromitrium hamatum Bartr. sp. nov.

Gracile, laxe caespitosum, caespitibus lutescenti-viridibus, opacis. Caulis elongatus, repens, remote ramosus, ramis circa 7 mm. longis. Folia ramea sicca contorta, humida flexuoso-patentia, 3–3.4 mm. longa, lineari-lanceolata, apice acuto, incurvo; marginibus superne erectis, minute serrulatis; costa percurrens; cellulae superiores rotundatae, leniter papillosae, incrassatae, basilares lineares, tuberculosae. Caetera ignota.

Rawlinson Range, elev. 7000–12000 ft., No. 12503.2.

Without fruit the relationship of this species is obscure but the curiously hooked tips of the branch leaves is unique in the genus. The character is suggestive of *Meiothecium hamatum* (C. M.) Broth. and *Acroporium hamatulum* Fleisch. but here the acumen is incurved. At least some and usually most of the leaves on every branch examined show this feature to a greater or less extent.

MACROMITRIUM SEMIPELLUCIDUM Doz. & Molk.

Wonimbu-Galumbu, *No. 41254.3.*

SCHLOTHEIMIA WALLISI C. M.

Rawlinson Range, elev. 7000–12000 ft., *Nos. 41377; 12445B.3.*

SCHLOTHEIMIA LONGISETA Dix.

A-mieng (A-mien), on Yaneng (Yanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft., *No. 12229.9.*

RHACOPILACEAE

POWELLIA INVOLUTIFOLIA Mitt.

Galumbu, elev. 4500 ft., *No. 41257.18.*

RHACOPILUM SPECTABILE Reinw. & Hornsch.

Bona, elev. 2500–4500 ft., *Nos. 41867.4; 41890.6.*—Wantoat, elev. 3500–6000 ft., *No. 10923.*

CRYPHAEACEAE

ACROCRYPHAEA CONCAVIFOLIA (Griff.) Bryol. Jav.

Matap, elev. 5000–6000 ft., *Nos. 11297.5; 11326.6.*

CYRTOPODACEAE

BESCHERELLEA CYRTOPUS F. V. Müll. var. PAPUANA (Broth. & Geh.) Par.

A-mieng (A-mien), on Yaneng (Yanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft., *Nos. 12229.2; 12229.6.*

PTYCHOMNIACEAE

GLYPTOTHECIUM SCIUROIDES (Hook.) Hampe.

Rawlinson Range, elev. 7000–12000 ft., *Nos. 12445B.2; 12503.9; 12503.10; 12503.11.*

These collections are without fruit but their identity is reasonably sure. Axillary, septate propagula about 225 μ long are abundant on most of the sterile stems.

PTEROBRYACEAE

TRACHYLOMA INDICUM Mitt.

Bona, elev. 2500–4500 ft., *No. 41555.13.*

TRACHYLOMA TAHITENSE Besch.

Rawlinson Range, elev. 7000–12000 ft., *No. 12445B.*

ENDOTRICHELLA CAMPBELLIANA Hampe.

Bona, elev. 2500–4500 ft., *Nos. 41519.1; 41521.3; 41555.1; 41566.4; 41646; 41841; 41867.8; 41890; 41899.5; 41899.7.*—Matap, elev. 5000–6000 ft., *No. 41022.*—Wonimbu-Galimbu, *No. 41254.1.*—Galumbu, elev. 4500 ft., *No. 41257.7.*

Dixon's remarks[1] on this species are instructive. It seems to be a frequent local species and fruits freely.

ENDOTRICHELLA BINSTEADII Broth.

Bona, elev. 2500–4500 ft., *No. 41841.1.*

No material of this species is available for comparison but the above collection agrees closely with the description in all particulars except that the leaves are plicate as well as undulate. The leaves are more

[2] Papuan Mosses, Journ. of Bot. 80: 10–11. 1942.

abruptly short pointed, the upper margins irregularly serrate and the upper leaf cells shorter than in either *E. perrugosa* Dix. or *E. Brassii* Bartr.

GAROVAGLIA MIRABILIS Dix.

A-mieng (A-mien), on Yaneng (Yanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft., *No. 12229.1.*

SYMPHYSODON MICHOLITZII (Broth.) Broth.

Matap, elev. 5000–6000 ft., *No. 11290.2.*—Galumbu, elev. 4500 ft., *No. 41257.8.*

METEORIACEAE

METEORIUM MIQUELIANUM (C. M.) Fleisch.

A-meing (A-mien), on Yaneng (Yanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft., *Nos. 1242; 12242.3; 12229.5.*—Matap, elev. 5000–6000 ft., *Nos. 11290.5; 11334 bis.1.*—Bona, elev. 2500–4500 ft., *Nos. 41556.7; 41899.6.*—Wantoat, elev. 3500–6000 ft., *Nos. 10968; 41178.*—Ulap Trail, sub- or alpine, *No. 41124.*—Galumbu, elev. 4500 ft. *No. 41257.*

AEROBRYOPSIS LONGISSIMA (Doz. & Molk.) Fleisch.

Bona, elev. 2500–4500 ft., *No. 41742.9.*—A-mieng (A-mien), on Yaneng (Yanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft., *No. 12229.11a.*

AEROBRYOPSIS LONGISSIMA (D. & M.) Fleisch. var. DOZYANA Fleisch.

Bona, elev. 2500–4500 ft., *Nos. 41867.5; 41890.15; 41899.2.*

BARBELLA ENERVIS (Mitt.) Fleisch.

Bona, elev. 2500–4500 ft., *No. 41566.2.*

FLORIBUNDARIA FLORIBUNDA (Doz. & Molk.) Fleisch.

Bona, elev. 2500–4500 ft., *Nos. 41496; 41555.14; 41556; 41742.10; 41742.12; 41890.2; 41908.*—Matap, elev. 5000–6000 ft., *Nos. 11116a; 11297.6; 41215.*—Amieng (A-mien), on Yaneng (Tanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft., *No. 12242.4.*—Wantoat, elev. 3500–6000 ft., *No. 11022.3.*—Galumbu, elev. 4500 ft., *No. 41257.14.*—Vicinity of Kajabit Mission, elev. 800–2000 ft., *No. 10674B.*

Floribundaria (Trachycladiella) crispata Bartr. sp. nov.

Dioica, robustiuscula, aureo-lutescens, opaca. Caules secundarii penduli, elongati, irregulariter et laxe ramosi. Folia patula, 3–3.5 mm. longa, sicca valde plures plicata, ovato-lanceolata, sensim in acumen elongatum, crispato-undulatum attenuata; margines erecti, ubique minute denticulati; costa tenuissima, supra medium folii

evanida; cellulis anguste linearibus, papillis pluribus, minutissimus instructis. Caetera ignota.

Rawlinson Range, elev. 7000–12000 ft., *No. 12503.1*.

Resembling *F. aurea* (Griff.) Broth. but sharply distinct in the plicate leaves with the acumens strongly undulate-crisped.

METEORIOPSIS RECLINATA (C. M.) Fleisch.

Bona, elev. 2500–4500 ft., *No. 41890.3*.—Galumbu, elev. 4500 ft., *No. 41257.17*.

AEROBRYUM SPECIOSUM Dȩz. & Molk.

Bona, elev. 2500–4500 ft., *No. 11296.2*.

NECKERACEAE

CALYPTOTHECIUM EXTENSUM Fleisch.

Bona, elev. 2500–4500 ft., *No. 41786*.—Wantoat, elev. 3500–6000 ft., *Nos. 10935a; 11022; 11022.1; 41081*.

Calyptothecium alar Bartr. sp. nov.

Dioicum, lutescenti-viride, nitidum. Caulis repens, ramis ad 5 cm. usque longis, dense ramulosis, ramulis patentibus, ad 1.5 cm. longis, parce complanatis. Folia conferta, sicca laxe imbricata, valde rugulosa, 2–2.5 mm. longa, concava, oblongo-ovalia, abrupte acuta, haud auriculata; margines erecti, superne minutissime denticulati; costa tenuis, longe infra apicem evanida; cellulae superiores anguste rhomboideae, incrassatae, basilares internae lineares, infimae breviores, alares pernumerosae, subquadratae, pellucidae, parietibus firmis. Caetera ignota.

Bona, elev. 2500–4500 ft., *No.41555.5*.—Wantoat, elev. 3500–6000 ft. *No. 41183* type.

Very distinct from all of its local congeners in the small, bluntly pointed, slightly decurrent but not auriculate leaves with very numerous subquadrate alar cells in a relatively large area.

CALYPTOTHECIUM RECURVULUM (C. M.) Broth.

Bona, elev. 2500–4500 ft., Nos. 41555.6; 41742.5; 41867.7; 41899.8.—Matap, elev. 5000–6000 ft., Nos. 11254; 11297.—Galumbu, elev. 4500 ft., No. 41258.

CALYPTOTHECIUM URVILLEANUM (C. M.) Broth.

Bona, elev. 2500–4500 ft., Nos. 41555.4; 41556.3; 41742.11; 41890.4; 41899.3.

NECKEROPSIS LEPINEANA (Mont.) Fleisch.

Bona, elev. 2500–4500 ft., *Nos. 41449; 41555; 41742; 41786.2*.—Wantoat, elev. 3500–6000 ft., *No. 11144*.

HOMALIODENDRON EXIGUUM (Bryol. Jav.) Fleisch.

Bona, elev. 2500–4500 ft., *No. 41742.8.*

HOMALIODENDRON FLABELLATUM (Sm.) Fleisch.

Bona, elev. 2500–4500 ft., *Nos. 41555.10; 41566.10; 41867.1; 41890.1.*—Amieng (A-mien), on Yaneng (Yanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft. *No. 12229.7.*

PINNATELLA MUCRONATA (Lac.) Fleisch.

Bona, elev. 2500–4500 ft., *No. 41890.12.*

PINNATELLA NANA (Williams) Bartr.

Wantoat, *No. 41183.3.*

Previously known only from the Philippines.

PINNATELLA KUHLIANA (Bryol. Jav.) Fleisch.

Bona, elev. 2500–4500 ft., *Nos. 41786.1; 41890.11.*

HOOKERIACEAE

CHAETOMITRIUM ORTHORRHYNCHUM (Doz. & Molk.) Bryol. Jav.

Bona, elev. 2500–4500 ft., *Nos. 41555.15; 41556.16; 41899.1.*

CHAETOMITRIUM PAPILLIFOLIUM Bryol. Jav.

Bona, elev. 2500–4500 ft., *No. 41841.2.*—Vicinity of Kajabit Mission, elev. 800–2000 ft., *No. 40819.*

CHAETOMITRIUM TORQUESCENS Bryol. Jav.

Bona, elev. 2500–4500 ft., *Nos. 41566.5; 41519.*—Galumbu, elev. 4500 ft., *No. 41257.9.*—Matap, elev. 4500 ft., *No. 41215.1.*

These collections possibly represent the var. *barbatum* Dix. but as no sporophytes are present they cannot be referred here definitely.

CHAETOMITRIUM PERLAEVE Dix.

Bona, elev. 2500–4500 ft., *Nos. 41498.1; 41890.14.*—Matap, elev. 500–6000 ft., *Nos. 11326.4; 11297.7.*—Wantoat, elev. 3500–6000 ft., *Nos. 1022.2; 41171.1*—Galumbu, elev. 4500 ft., *No. 41257.6.*

The above collections all agree in having the stem leaves acuminate, the branch leaves short pointed, setae smooth, 13–14 mm. long and calyptrae smooth, sparsely ciliate at base and slightly setulose toward apex. I have not seen the type of *C. perlaeve* Dix. but the above characters in the aggregate seem to make the identification reasonably sure.

Chaetomitrium subplicatum Bartr. sp. nov.

Sat robustum, fuscescenti-viride, nitidum. Caules ramosi, ramis turgidis, obtusis. Folia ramea conferta, haud spiraliter imbricata, 1.2 mm. longa, ovata, profunde plicata, concava, brevissime acuta, acumine recurvo; marginibus erectis, subintegris, propter apicem involutis; cellulae angustissime, laevissimae. Seta ad 3 cm. longa, purpurea, inferne laevis, superne minutissime papillosa; theca inclinata, 3 mm. longa; calyptra campanulata ?, inferne haud ciliata, apice tantum parcissime setulosa.

Amieng (A-mien), on Yaneng (Yanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft., *No. 12214.*

Possibly near *C. plicatum* Bartr. but certainly distinct in the setae only faintly papillose above, the short, recurved leaf acumen and the leaves not spirally ranked.

HYPOPTERYGIACEAE

HYPOPTERYGIUM DAYMANNIANUM Broth. & Geh.

Bona, elev. 2500–4500 ft., *Nos. 41555.11; 41890.13.*

CYATHOPHORELLA SPINOSA (C. M.) Fleisch.

Bona, elev. 2500–4500 ft.; *Nos. 41555.3; 41556.9.*

FABRONIACEAE

FABRONIA CURVIROSTRIS Doz. & Molk.

Wantoat, *No. 41183.4.*

SCHWETSCHKEA GRACILLIMA Fleisch.

Bona, elev. 2500–4500 ft., *No. 41498.*—Wantoat, *No. 40884* in part.

Through the courtesy of the Farlow Herbarium I have had the privilege of examining the two collections of *S. gracillima* from Sumatra cited by Fleischer. As a result I am confident that *Macgregoriella philippinensis* Bartr. of the Philippines is precisely the same thing and should be reduced to synonymy. The short, rudimentary peristome teeth are sharply diagnostic but the character scarcely seems of generic importance. The range of *S. gracillima* is therefore extended to include the Philippines and New Guinea.

THUIDIACEAE

THUIDIUM INVESTE (Mitt.) Jaeg.

Wantoat, elev. 3500–6000 ft., *No. 11021.*

THUIDIUM MEYNENIANUM (Hampe) Bryol. Jav.

Bona, elev. 2500–4500 ft., *No. 41497.*

THUIDIUM CYMBIFOLIUM (Doz. & Molk.) Bryol Jav.

Bona, elev. 2500–4500 ft., *Nos. 41520; 41890.9.*—A-mieng (A-mien), on Yaneng (Yanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft., *No. 12242.1.*

AMBLYSTEGIACEAE

DREPANOCLADUS FLUITANS (Hedw.) Warnst.

Rawlinson Range, elev. 7000–12000 ft., *No. 12503.7.*—Upper Camp A, elev. 9000–10000 ft., March 27, 1939.

These collections are especially noteworthy. The genus *Drepanocladus* has not previously been recorded from New Guinea and its occurrence at high altitudes in the Morobe District apparently represents isolated colonies remaining after the southward retreat of the austral flora in prehistoric times.

BRACHYTHECIACEAE

EURHYNCHIUM CELEBICUM (Bryol Jav.) Bartr.

Bona, elev. 2500–4500 ft., *No. 41662a.*

RHYNCHOSTEGIELLA MENADENSIS (Bryol. Jav.) Bartr.

Vicinity of Kajabit Mission, elev. 800–2000 ft., *No. 40819.1.*

Rhynchostegiella stellata Bartr. sp. nov.

Lutescenti-viridis, haud nitida. Caulis dense ramosus, ramis vix 5 mm. longis. Folia ramea horride patula, sicca immutata, 1.5 mm. longa, e basi ovata sensim longe et filiformiter acuminata; marginibus ubique minutissime serrulatis; costa tenuis, infra medium folii evanida; cellulae anguste lineares, alares perpaucae. Folia perichaetialia sensim in acumen elongatum, denticulatum producta; seta 8–10 mm. longa, inferne laevis, superne papillosa; theca suberecta, deoperculata 1 mm. longa; operculum longissime rostratum.

Matap, elev. 5000–6000 ft., *No. 11297.9.*

An attractive little plant suggesting *Campylium hispidulum* to the naked eye. It is widely distinct from *R. papuensis* Bartr. in the widely spreading, filiform-acuminate leaves.

ENTODONTACEAE

ERYTHRODONTIUM JULACEUM (Hook.) Par.

Vicinity of Kajabit Mission, elev. 800–2000 ft., *No. 10798A.*

CAMPYLODONTIUM FLAVESCENS (Hook.) Bryol. Jav.

Bona, elev. 2500–4500 ft., *No. 41499.*—Matap, elev. 5000–6000 ft., *Nos. 11242; 11297.2; 11326; 11334 bis.5.*

ENTODON ARMITII C. M.

Bona, elev. 2500–4500 ft., *Nos. 41660; 41662.*—Matap, elev. 4000–5000 ft., *No. 41215.2.*—Galumbu, elev. 4500 ft., *No. 41257.1.*

SEMATOPHYLLACEAE

Aptychella Clemensiae Bartr. sp. nov.

Dioica, gracilis, caespitosa, caespitibus compactis, lutescentibus, nitidis. Caulis brevis, repens, ramosus, ramis ad 2 cm. longis, caudato-attenuatis, propter apicem propagula numerosa, filiformia, articulata instructi. Folia inferiora patentia, 2 mm. longa, 0.4 mm. lata, anguste oblongo-lanceolata, leniter plicata, sensim breviter acuminata; margines recurvi, superne denticulati; costa tenuis, supra medium folii evanida; cellulae lineari-rhomboideae, 4–7 μ latae, apicales breviores, infimae laxae, hyalinae, alares paucissime, haud colorati. Folia superiora appressa, angustiora. Caetera ignota.

Wantoat, on small tree, *Nos. 41081a* type; *41171.*

The nerved leaves evidently ally this species with *A. brevinervis* (Fleisch.) Fleisch. of Java but in detail the distinctions are clearly marked. The New Guinea plants are more slender with the lower branch leaves spreading and the upper leaves appressed so that the branches end in a slender, caudate tip. The lax, colorless cells at the extreme leaf base, in 2–3 rows across the insertion without any distinct alar group, are also sharply distinctive.

TRISMEGISTIA RIGIDA (Hornsch. & Reinw.) Broth.

Wantoat, *No. 41184.1.*

TRISMEGISTIA LANCIFOLIA (Harv.) Broth.

Matap, elev. 5000–6000 ft., *No. 11290.4.*

ACANTHOCLADIUM CLARKII Dix.

Rawlinson Range, elev. 7000–12000 ft., No. 12503.

Meiothecium crispum Bartr. sp. nov.

Sat robustum, caespitosum, caespitibus mollibus, late extensis, aureo-lutescentibus, nitidis. Caulis ad 4 cm. longus, irregulariter ramosus, dense foliosus. Folia erecto-patentia, sicca et humida valde crispato-undulata, 2.5 mm. longa, oblongo-ovata, ecostata, acuminata, acumine recurvo; marginibus integris, fere ad apicem revolutis; cellulae lineares, valde incrassatae, porosae, apicales breviores, infimae aurantiacae, alares magnae, vesiculosae. Caetera ignota.

A-mieng (A-mien), on Yaneng (Yanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft., *No. 12055 bis.*

The strongly crispate leaves are unique and have no parallel in the genus but the curiously recoiled leaf apex evidently allies the species to the group typified by *M. hamatum* (C. M.) Broth.

Meiothecium (Eumeiothecium) longisetum Bartr. sp. nov.

Autoicum, dense caespitosum, caespitibus fuscescentibus, nitidis. Caulis circa 2 cm. longus, irregulariter ramosus. Folia conferta, sicca imbricata, humida erecto-patentia, 2.5–3 mm. longa, leniter plicata, ecostata, ovato-lanceolata, subulato-acuminata; margines integri, supra medium folii recurvi; cellulae lineari-rhomboideae, parietibus firmis, pellucidis, infimae lutescentes, breviores, alares magnae, vesiculosae. Seta tenuis, 14–17 mm. longa, ubique laevissima; theca inclinata, magna, oblongo-cylindrica, deoperculata 2.5 mm. longa, curvata; peristomium simplex, dentes haud conferti, dense papillosi.

Matap, elev. 5000–6000 ft., *No. 11334 bis.4.*

In *Meiothecium* the setae are typically short. I know of no other species with the setae as long as they are here.

ACROPORIUM DIMINUTUM (Brid.) Fleisch.

Bona, elev. 2500–4500 ft., *No. 41867.3.*

ACROPORIUM STRAMINEUM (Reinw. & Hornsch.) Fleisch.

Bona, elev. 2500–4500 ft., *Nos. 41742.3; 41890.10.*

RHAPHIDOSTICHUM PULLEI Dix.

Matap, elev. 5000 ft., *No. 41215.5.*

TAXITHELIUM NITIDULUM Broth. & Par.

Bona, elev. 2500–4500 ft., *No. 41555.8.*

HYPNACEAE

ECTROPOTHECIUM CIRCINNATULUM Thér.

A-mieng (A-mien), on Yaneng (Yanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft., *Nos. 12214.3; 12229.13.*—Galumbu, elev. 4500 ft., *No. 41257.10.*—Bona, elev. 2500–4500 ft., *No. 41521.4.*—Matap, elev. 4000–5000 ft., *No. 41215.3.*

These collections are referred here with considerable reservation. Thériot separates the species from *E. sodale* (Sull.) Mitt. but the distinctions are slight and apparently of little value.

Ectropothecium perplicatum Bartr. sp. nov.

Species E. plicato Bartr. & Dix. affinis sed foliis caulinis anguste triangulari-lanceolatis (haud ovatis), profunde plicatis et subintegris dignoscenda.

Rawlinson Range, elev. 7000–12000 ft., *No. 12445B.12.*

In this complex group it seems almost useless to create another species yet the above collection differs so markedly from the nearly related Bornean plant that there appears to be no alternative. Here the more strongly falcate, deeply plicate, subentire stem leaves are in bold contrast to the slightly falcate, ovate-lanceolate, strongly serrate stem leaves of the plants from Borneo.

ECTROPOTHECIUM PLUMOSUM Dix.

Bona, elev. 2500–4500 ft., *Nos. 41523; 41890.5.*

ECTROPOTHECIUM BUITENZORGII (Bel.) Jaeg.

Bona, elev. 2500–4500 ft., *No. 41867.9.*

ECTROPOTHECIUM TAPES Broth.

Matap, elev. 5000–6000 ft., *No. 41044.*

TRACHYTHECIUM VERRUCOSUM (Hampe) Fleisch.

A-mieng (A-mien), on Yaneng (Yanem) River, a tributary of the Buso River, above mouth of Tosapik Creek, elev. 5000–6000 ft., *No. 12214.1.*

ISOPTERYGIUM PENDULUM Dix.

Bona, elev. 2500–4500 ft., *No. 41464a.*

VESICULARIA MIQUELII (Bryol. Jav.) Fleisch.

Bona, elev. 2500–4500 ft., *No. 41474.*

CTENIDIUM LUZONENSE Broth.

Rawlinson Range, elev. 7000–12000 ft., *Nos. 12445B.15; 12503.14.*

HYLOCOMIACEAE

MACROTHAMNIUM HYLOCOMIOIDES Fleisch.

Rawlinson Range, elev. 7000–12000 ft., *No. 12448.1.*—Matap, elev. 5000–6000 ft., *No. 11296.1.*

DAWSONIACEAE

DAWSONIA GRANDIS Schlieph. & Geh.

Matap, elev. 5000–6000 ft., *No. 11317a.*

JUBULA PENNSYLVANICA

LOIS CLARK AND T. C. FRYE

JUBULA PENNSYLVANICA (Steph.) Evans, Rhodora **7**: 55. 1905.

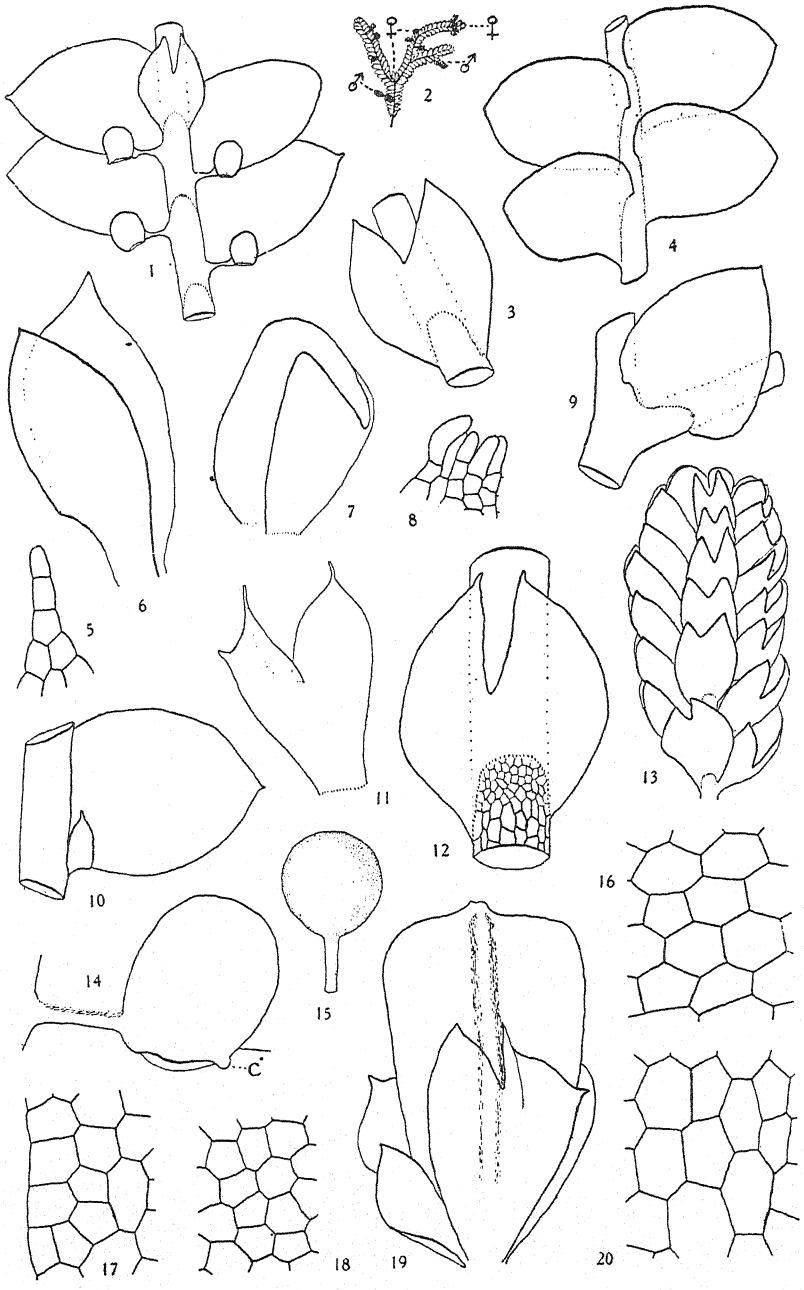
Frullania Hutchinsiae var. β, in G. L. & N. Syn. Hep. 775. 1847.
Frullania pennsylvanica Steph., Hedwigia **22**: 47. 1883.
Frullania Hutchinsiae var., in Underwood, Bull. Illinois State Lab. Nat. Hist. **2**: 65. 1884.
Jubula Hutchinsiae var. *Sullivantii* Spruce, Trans. Proc. Bot. Soc. Edinburgh **15**: 62. 1884.
Jubula Hutschisiae subsp. *pennsylvanica* Verd., Ann. Crypt. Exot. **1**: 215. 1928.

Plants in patches, dark green; leafy stems 1–2 mm. wide. Stems prostrate, 1–2 cm. long, 105–160 μ thick, irregularly pinnately branched; branches moderately numerous, united with base of leaf of origin and replacing the ventral lobe, their first leaves and underleaves mere bracts. Dorsal lobes of stem leaves imbricate, ovate, 485–985 μ long, 420–740 μ wide, somewhat concave ventrally; apex bent toward ventral side, rounded to apiculate, the apical tooth rarely more than 3 cells long; margins entire, dorsal one arching to about middle of stem. Ventral lobe of stem leaf nearly parallel with the stem and distant from it by half to once the stem width, wholly saccate or wholly explanate. Saccate ventral lobe helmet-shaped, globose or nearly so, 190–230 μ long, 180–215 μ wide, often slightly contracted at mouth, with a cilium at distal rim of mouth or in rare cases the cilium represented by a single projecting cell; stalk the thickened folded margin of the dorsal lobe between stem and ventral lobe, almost at right angles to the stem. Stylus wanting or obsolete. Explanate ventral lobes common, variable, comparatively small. Cells of middle of dorsal lobe of stem leaf 15–25 μ, of margin 13–22 μ, of base 19–39 μ; all walls thin; trigones and intermediate thickenings wanting; paracysts wanting. Gemmae unknown. Underleaves of stem distant to contiguous, 2-lobed, broadly elliptic, 130–580 μ long as measured from middle of insertion, 175–600 μ wide, at base gradually narrowed and rather long decurrent, the insertion arching upward about stem width; lobes usually acute to acuminate but occasional ones rounded; sinus descending two-fifths to two-thirds the length, acute to narrowly rounded; margins entire or occasionally one or both angular-dentate. Plants bisexual. Male inflorescence constituting a lateral branch not eliminating the ventral lobe of the leaf of origin, oblong, sometimes 2 in succession constituting the same lateral branch with a few small leaves between them, not always close to the female inflorescence. Male bracts 8–16, 2-lobed; the halves about equal or the ventral one the smaller, ovate, apices rounded to acuminate, margins entire, stylus not represented; dorsal half of median bract about 300 μ long and 200 μ wide. Male bracteoles present through-

out the inflorescence, ovate to elliptic, 2-lobed, the median ones averaging about 370 μ long as measured from the middle of the insertion and 265 μ wide, decurrence and insertion like that of the underleaves; lobes mostly acute to acuminate, sometimes rounded; sinus descending one-quarter to one-half the length; margins entire; antheridia 1–2. Female inflorescence terminal on a stem or a lateral branch; subfloral innovations 1–2, immediately beneath the female bracts, each adnate to a bract. Female bracts 2-lobed with the dorsal half slightly the larger; the halves elliptic to obovate, apex acute to acuminate or apiculate, sinus two-thirds to three-fifths the length, margins entire or with one or both halves of the bract unidentate; dorsal half about 1.47 mm. long and 640 μ wide; ventral half about 1.35 mm. long and 530 μ wide. Female bracteole free from the bracts, 2-lobed for about one-half the length, obovate, about 1 mm. long; lobes ovate, about 360 μ wide; margins entire or with a tooth on one or both outer margins. Underleaf just below female bracteole sometimes with 4 marginal teeth. Perianth one-third to one-half emergent, dorsally compressed, obovoid, about 1.3 mm. long and 720 μ wide, not or hardly tuberculate, abruptly truncate to beak, composed of isodiametric cells with thin walls; keels 3, 0 dorsal, 2 lateral, 1 ventral, all high and thin; beak as long as wide or shorter. Sporophyte not seen mature. On rocks or soil, in damp or wet situations or in dense shade.

SPECIMENS EXAMINED: ALABAMA. Sipsey river in Winston County (*Underwood & Cook 199*) 1896. MASSACHUSETTS. Oxford (*Greenwood 232*) 1932. NORTH CAROLINA. Bald Creek in Swain County (*Taylor 2833*) 1935; Highlands in Mason County (*Welch 2606*) 1936, and (*Fulford*) 1934. OHIO. Rock House near Laurelville (*Frye*) 1944. TENNESSEE. Allardt in Fentress County (*Sharp 34885* = *Verdoorn's Hep. Select. et Crit. 426*) 1934; Mt. Leconte in Sevier County (*Sharp 34915*) 1934.

FIGS. 1–20. JUBULA PENNSYLVANICA. 1. Part of plant, ventral view, × 20. 2. Plant, × 1. 3. Male bracteole from middle of inflorescence, × 64. 4. Part of stem, dorsal view, × 20. 5. Typical apex of lobe of underleaf, × 277. 6. Female bract, ventral view, × 30. 7. Male bract, ventral view, × 64. 8. Part of mouth of perianth, × 277. 9. Leaf inserted on both stem and branch, dorsal view, × 39. 10. Leaf with explanate ventral lobe, × 51. 11. Female bracteole, × 30. 12. Underleaf of stem, × 113. 13. Male inflorescence, ventral view, × 30. 14. Saccate ventral lobe of leaf with rudiment of cilium (*c*), × 90. 15. Antheridium, × 113. 16. Median cells of dorsal lobe of stem leaf, × 277. 17. Marginal cells of dorsal lobe of stem leaf, × 277. 18. Cells of upper part of perianth, × 277. 19. Perianth, ventral view, × 39. 20. Basal cells of dorsal lobe of stem leaf, × 277. (All original, drawn from material gathered near Laurelville, Ohio. Plate by courtesy of the University of Washington.)



FIGS. 1–20. JUBULA PENNSYLVANICA

ILLUSTRATIONS: Ammons, Amer. Midland Nat. **23**: 149, *figs. D*, 1940. Haynes, Bryologist **30**: *pl. 3, fig. 2.* 1927. Lorenz, THE BRYOLOGIST **11**: 47, *figs 1–9.* 1908.

Range: Nova Scotia to Ohio and southward to Oklahoma, Alabama and Georgia; Bermuda. This is according to published reports which are probably correct.

Buch & Persson (Soc. Sci. Fennica, Comm. Biol. **8** (7): 11, 1938) report it from the Azores and Madeira, but there remains doubt whether this should not be referred to *J. Hutchinsiae* subsp. *Hutchinsiae* Verd.

Since the publication of the type species, *J. Hutchinsiae* Hooker (Brit. Jung. pl. 1, 1816), material more or less grading into it has been found around the world. Just how to split the material into segments and what taxonomic rank to assign to them is a matter upon which taxonomists do not agree. Such questions are best settled by the study of much material and the limits of variation. It seems best to leave the question of rank until much more material is available especially from the tropical regions around the world. South of the United States is the segment *bogotensis*. However, the collections from south of the United States are so few that it is not clear how close these two approach each other. So far as known at present the southern boundary of the United States is the southern limit of *J. pennsylvanica.*

When two male inflorescences occur on the same branch the distal one is evidently a rejuvenation from the tip of the basal one, in the next growing season. When there are antheridia in the distal one there are no longer any in the basal one. This is shown in the illustration by Haynes.

Any green plant with saccate ventral lobes like *Frullania*, with the insertion of the underleaf strongly arched, and with thin cell walls and practically no trigones in the dorsal lobes of mature leaves, may be strongly suspected of belonging here if found within our territory.

We use the word paracysts, meaning different cells, instead of the word ocelli, meaning little eyes. It is only in a few of the species in the Lejeunoid group that these cells suggest eyes.

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STUDIES IN CALLIERGON AND RELATED GENERA

FRANCES E. WYNNE

Of the genera included in the family Amblystegiaceae, *Calliergon* is most closely related to *Drepanocladus*. The two genera have similar morphologic variations, phylogeny, distributions, and habitat preferences. A detailed discussion of *Drepanocladus* has already appeared (Wynne 1944a, b, c; & 1945), so here I will merely point out wherein *Calliergon* is similar to *Drepanocladus*.

Similar modifications of cells, cell walls, and costae are responsible for a parallel series of species in *Drepanocladus* (Wynne 1944a) and *Calliergon*. The species of both genera with incrassate, pitted cell walls are in general more northern in their distribution and less variable in size and shape of leaves and cells than those with thin-walled cells. The stable, arctic species (with incrassate cell walls) of *Calliergon* are *C. sarmentosum*, *C. trifarium*, and *C. turgescens*, corresponding to *Drepanocladus lycopodioides*, *D. badius*, *D. brevifolius*, and *D. revolvens*. The variable boreal species (with thin-walled cells) of *Calliergon* are *C. cordifolium*, *C. stramineum*, and *C. richardsoni*, paralleling *Drepanocladus aduncus*, *D. fluitans*, *D. exannulatus*, and *D. vernicosus*.

The variable boreal species of *Drepanocladus* and *Calliergon* respond similarly to changes in the environmental conditions by the production of atypical leaves. They produce, under certain environmental conditions, short, broad leaves with short, wide cells. Both produce also, when growing submerged or with an abundance of water, an aquatic phase characterized by large cells, large leaves and pinnate branching. In *Drepanocladus* these habitat phases are frequent in *D. aduncus*, *D. fluitans*, and *D. exannulatus* (Wynne 1944c). In *Calliergon* they occur, so far as I know, only in *C. cordifolium*.

Numerous names have been proposed in both genera for these variations which I consider merely habitat phases. I have reduced these to synonyms when I have seen the types. In other instances I have excluded the names.

Calliergon in North America is apparently limited in its distribution by the maximum extent of glaciation during the Pleistocene Era. Although it occurs in isolated areas south of the glacial border, it is most common on areas which were glaciated. *Calliergon cordifolium* and *C. stramineum* are the only species which have been found south of the terminal moraines. I have seen *C. stramineum* from only one

locality south of the maximum extent of glaciation: Mountain Lake, Virginia, May 31, 1890, *Dr. & Mrs. N. L. Britton et al* (NY). *C. cordifolium* is represented by several collections on unglaciated areas in Pennsylvania, Ohio, West Virginia, and Tennessee: PENNSYLVANIA: West Branch Swamp, McKean Co., May 26, 1895, *D. A. Burnett* (DUKE, NY); Foster Branch Swamp, McKean Co., July 30, 1894, *D. A. Burnett* (DUKE, NY); Quakertown, Bucks Co. (NY); Dillerville Swamp, Lancaster Co., July 25, 1894, *J. K. Small* (NY, DUKE, TENN). OHIO: Liberty Township, Jackson Co., Sept. 15, 1937, *Bartley & Pontius* (NY). WEST VIRGINIA: Cass, alt. 3800′, Nov. 15, 1928, *Fred W. Gray M-1008* (TENN, WVA); Cheat Mountain, alt. 3800′, May 26, 1928, *Fred W. Gray M-971* (TENN, WVA); Bald Knob, Spruce, July 30, 1929, *Nelle Ammons 13* (WVA). TENNESSEE: Johnson Co., *A. J. Sharp 34542, 34548, 34381* (TENN).

Drepanocladus, which is similarly limited by glaciation, occurs with *Calliergon* in all these localities except those in McKean and Bucks Counties, Pennsylvania, Johnson County, Tennessee, and Mountain Lake, Virginia (Wynne 1944b). It is not surprising that the two genera are found associated in a few bogs and swamps south of the glaciated territory. In both genera it is only the variable boreal species which ever occur south of the glaciated area—in *Calliergon, C. stramineum* and *C. cordifolium* and in *Drepanocladus, D. exannulatus, D. fluitans*, and *D. aduncus*. The variable boreal species in each genus apparently have the same habitat preferences and requirements. Throughout their range where they are abundant in northern North America they are found growing together.

The distribution of plants in past geologic ages is always interesting in connection with their present geographical distribution. The fossil record, although sketchy for bryophytes, is helpful in suggesting their Pleistocene ranges. *Calliergon*, as would be expected, has almost always been found fossilized with *Drepanocladus*. Either *Calliergon* or *Drepanocladus*, or both, has been found in nearly every reported collection of fossil mosses. This can be explained probably by their occurrence in aquatic or semi-aquatic habitats, throughout Pleistocene and modern times, and their tendency to form peat.

Williams (1930) and Cooper and Foot (1932) reported *Drepanocladus minnesotensis* sp. nov., *Calliergon giganteum*, and *Neocalliergon integrifolium* gen. and sp. nov. from Minneapolis, Minnesota. Specimens of these are in the herbarium of the New York Botanical Garden

and have been examined. The specimen called *Calliergon giganteum* appears to be the aquatic phase of *C. cordifolium*. *Neocalliergon integrifolium* is very similar to *Calliergonella cuspidata* in its microscopic structure except that it has no central strand in the stem and no inflated cells at the angles of the leaves.

From Oelwein, Iowa, Holzinger (1903) reported *Calliergon richardsoni* found with several species of *Drepanocladus*. Wilson (1932) in his detailed study of fossil deposits in Wisconsin found *Calliergon cordifolium*, *C. stramineum*, and *C. turgescens* with other mosses, including several species of *Drepanocladus*. These species were identified and previously reported by Cheney (1930, 1931).

Steere (1942) has reported on the largest collection of Pleistocene mosses known to the author. Among the 32 species examined by him were five species of *Drepanocladus*, one of them new, and nine species of *Calliergon*, three of them new. All of the species of *Calliergon* recognized by me in the present treatment, except *C. sarmentosum*, were represented in these Aftonian beds. The material of *Drepanocladus* and *Calliergon* from these deposits is particularly interesting because of its bearing on the relationships between the two genera: "Many specimens were found which possessed characteristics of both *Drepanocladus* and *Calliergon*, and appeared intermediate between them. This fact seems to point to a common ancestry for both groups rather than to a parallel development as a reaction to the same environment, as is believed by many bryologists" (p. 87).

In addition to the fossilized material of *Calliergon* reported in the literature are herbarium specimens: *C. cordifolium*, near Faunus Sta., Mich. T 41 N, R 26 W. July–Sept. 1905. *C. A. Davis* (MICH, NY); *C. trifarium*, peat mine bogs 4 mi. s. of Columbus, Franklin County, Ohio, *E. N. Transeau*, 1939 (OS).

Although fossil records of the species of *Calliergon* are not sufficient to reconstruct in detail their Pleistocene distribution, the phytogeographic discussions of *Drepanocladus* (Wynne 1944b) can be applied to *Calliergon*. It is probable that not only do the two genera have similar distributions today but also have had similar histories.

Known fossils indicate that the Pleistocene range of each species was similar to its present distribution. The two genera were apparently more widespread and represented by more species during previous geologic ages than today. In both genera some of the widespread and variable boreal-montane species have been found fossilized south of their present range.

Drepanocladus exannulatus, D. fluitans, Calliergon stramineum, and *C. richardsoni* are found south of their present range in the fossil beds in Iowa. All other localities at which fossils of *Calliergon* and *Drepanocladus* have been found are within the present limits of respective species. There are no records of the fossils of the arctic-alpine species of *Drepanocladus*. It is interesting, however, that *Calliergon trifarium* and *C. turgescens,* characterized today by arctic and local distributions, occurred at one time as far south as Iowa.

Closely related to the species included in *Calliergon* are two species, here recognized as belonging to separate and monotypic genera—*Calliergonella cuspidata* and *Pleurozium schreberi.* Both have had a kaleidoscopic history. *Calliergonella cuspidata* was placed in *Calliergon* by Kindberg when he proposed the genus in 1896. Lindberg placed it in *Acrocladium* with *A. auriculatum* (southern South America) and *A. chlamydophyllum* (Australia, Tasmania, New Zealand). Since both these species of *Acrocladium* from the southern hemisphere have porose cell walls throughout the leaf I feel the relationship of *Calliergonella cuspidata,* in which none of the leaf cells are porose, to *Acrocladium* is not of a generic nature and have therefore maintained the genus *Calliergonella* for our North American species, *C. cuspidata.*

Pleurozium schreberi was segregated from *Hypnum* into *Hylocomium* in the same year that the genus *Pleurozium* was proposed by Mitten (1869). Grout in 1931 placed it in *Calliergonella* with *C. cuspidata.* Neither of these treatments seems as satisfactory a disposition of this distinctive species as the recognition of the monotypic genus *Pleurozium.*

Calliergidium was proposed as a subgenus of *Hypnum* in 1902 (THE BRYOLOGIST **4**: 63. 1901; **5**: 64. 1902) by Renauld for *H. tundrae, H. bakeri, H. pseudostramineum,* and *H. plesistramineum.* Grout, in 1929 (Check-List, p. 17), raised *Calliergidium* to generic rank and included *C. pseudostramineum* with vars. *plesistramineum* (Ren.) Grout and *hoveyi* Grout, and *C. bakeri* (Ren.) Grout. I have examined the type material of all these species and find no evidence for maintaining the genus *Calliergidium. C. pseudostramineum* is *Drepanocladus fluitans;* var. *plesistramineum* is *Drepanocladus exannulatus;* var. *hoveyi* belongs in either *Hygroamblystegium* or *Amblystegium,* and *C. bakeri* belongs in *Hygrohypnum.* Further studies in the Amblystegiaceae will enable me to place these last named two species more certainly in their respective genera.

Material has been borrowed for study from the institutions listed below, and the author wishes to express appreciation to the various curators for their generosity. In the lists of specimens the herbaria are represented by the following abbreviations:

BART—E. B. Bartram, Bushkill, Pennsylvania.
CM—Carnegie Museum, Pittsburgh, Pennsylvania.
DPU—DePauw University, Greencastle, Indiana.
DUKE—Duke University, Durham, North Carolina.
MICH—University of Michigan, Ann Arbor.
NY—The New York Botanical Garden.
OS—Ohio State University, Columbus.
TENN—University of Tennessee, Knoxville.
MO—Missouri Botanical Garden, St. Louis.
WVA—West Virginia University, Morgantown.

The following individuals have loaned their private herbaria and to them also the author is grateful: Dr. Winona H. Welch, DePauw University; Dr. Richard T. Wareham, Ohio State University; Mrs. Fay A. MacFadden, Los Angeles, California.

Exsiccati are cited geographically according to states and provinces from east to west and north to south. Exsiccati without locality are listed separately for each species. The abbreviations used are as follows.:

Grout, North American Musci Pleruocarpi—N. A. M. Pl.
Grout, North American Musci Pleurocarpi Supplement—N. A. M. Pl. Suppl.
Grout, North American Musci Perfecti—N. A. M. Perf.
John Macoun, Canadian Musci—Can. Musci.
John Macoun, Canadian Mosses—Can. Mosses
W. S. Sullivant & L. Lesquereux, Musci Boreali Americani—M. Bor. Am.
J. A. Allen, Mosses of the Cascade Mountains—Cascade Mts.
Coe Finch Austin, Musci Appalachiani—M. App.
J. A. Moore and J. Steyermark, Plants of Grand Teton National Park—Grand Teton Nat. Park
Thomas Howell, Pacific Coast Plants—Pac. Coast
Renauld & Cardot, Musci Americae Septentrionalis Exsiccati—M. Am. Sept.
Reliquiae Farlowianae Musci—Rel. Farlow.
John W. Holzinger, Mosses of N. E. Minnesota—N. E. Minn.
Thomas Drummond, Musci Americani—M. Am.
W. S. Sullivant, Musci Allegheniensis—M. Allegh.
Chas. W. Shaw, Selkirk Flora—Selkirk Fl.
Musci Leibergiani—M. Leib.

KEY TO THE GENERA

Costa strong, single ..... 1. *Calliergon.*
Costa weak, short and double
  Stems green or brownish, alar cells inflated and hyaline, decurrent ..... 2. *Calliergonella.*
  Stems red, alar cells rectangular, colored, not decurrent .... 3. *Pleurozium.*

1. CALLIERGON (Sull.) Kindb. Eur. & N. Amer. Bryin. 79. 1896

Hypnum sp. Hedwig, Sp. Musc. 254, 255. 1801.
Hypnum subg. *Calliergon* Sull., Musci U. S. 672. 1856.
Amblystegium sp. De Not,. Atti Univ. Genova **1**: 135. 1869.
Amblystegium F. *Calliergon* Lindb., Musci Scand. 34. 1879.
Calliergon I *Eu-Calliergon* Kindb., Eur. & N. Am. Bryin. 80. 1896.

Dioicous or autoicous. Plants slender and soft or robust and stiff, varying in color: stramineous, yellow-green, green, orange, red, purple, brown, or black; stems erect, ascending, creeping, or floating, 3–30 cm. long, simple, irregularly or regularly pinnately branched, a central strand apparent in cross-section; apical buds of stems and branches cuspidate, never falcate-secund; stems radiculose in *C. cordifolium*, the apex of some leaves of *C. cordifolium* and *C. stramineum* always bearing radicles.

Stem leaves ovate, lanceolate, or linear-lanceolate; 1–5 × 0.4–2.8 mm.; clasping the stem at intervals of 0.3–0.9 mm.; spreading or loosely or closely imbricated; long decurrent at the auricles; striate or plicate when dry (*C. stramineum* retaining a few plications), shallowly concave or spoon-shaped; margin entire, sometimes inrolled when dry; apex cucullate, obtuse or minutely apiculate; line of insertion of leaf truncate or concave. Costa single, distinct, reaching to the middle of the leaf or percurrent and extending to within 2–6 cells of the apex, never excurrent.

Cells linear, thin-walled or incrassate and pitted; median leaf-cells 6–10 × 60–100 μ; cells at apex shorter than median cells; alar cells thin-walled, poorly or well delimited, quadrate or inflated, hyaline or colored, confined to the basal angles or extending to the costa.

Antheridial buds produced on the primary stems; perigonial leaves ovate, or broadly lanceolate, obtuse or abruptly acuminate, ecostate or short costate; antheridia ovate or cylindric; paraphyses consisting of 3–5 cells. Perichaetium 3–4.5 mm. long, sheathing the base of the seta; outer perichaetial leaves oval, abruptly acuminate, ecostate or weakly costate; inner perichaetial leaves lanceolate, acuminate, costate ¾ the length.

Seta 2–8 cm. long, smooth, reddish or brown; capsule 2–3 × 0.7–2 mm., oblong, cernuous or horizontal, smooth, slightly contracted under the mouth when dry; operculum conic or apiculate, 0.4–0.7 mm. high; annulus lacking except in *C. trifarium* where it is 3–5 cells wide; peristome perfect, hypnaceous, outer peristome golden or yellow, inner peristome pale, cilia in 2's or 3's.

TYPE SPECIES: *Hypnum cordifolium* Hedw.

HABITAT: Aquatic or semi-aquatic, growing in bogs, swamps, ponds, marshes, sluggish streams, or damp earth, not on rocks or rotten wood.

KEY TO SPECIES OF CALLIERGON

All cell walls thin, not porose
- Costa percurrent, ending 4–8 cells from the apex.....1. *C. cordifolium.*
- Costa short, reaching only 0.5–0.8 length of leaf
  - Apices of some leaves bearing radicles at the back, leaves narrowly lanceolate, imbricated.....2. *C. stramineum.*
  - Apices of leaves never with radicles, leaves broadly lanceolate or deltoid, erect or spreading.....3. *C. richardsoni.*

Some cell walls incrassate and porose
- Leaf apices with a minute apiculus
  - Auricles distinct, of several inflated, thin-walled cells; plants usually red.....4. *C. sarmentosum.*
  - Auricles indistinct, alar cells quadrate or rectangular, not inflated, plants brown or olive, turgid.....5. *C. turgescens.*
- Leaf apices rounded, obtuse; leaves spirally imbricated in 3 rows.....6. *C. trifarium.*

1. CALLIERGON CORDIFOLIUM (Hedw.) Kindb., Eur. & N. Am. Bryin. 80. 1896.

Hypnum cordifolium Hedw., Sp. Musc. 254. 1801.

Hypnum cordifolium var. *compactum* C. Müll., Syn. **2**: 380. 1851.

Amblystegium cordifolium De Not., Atti Univ. Genova **1**: 136. 1869.

Hypnum cordifolium var. *angustifolium* Schimp. in Klinggr., Leb.-und Laubm. w. und Ostpreuss. 291. 1893.

Hypnum cyclophyllotum Holz., Minn. Bot. Stud. Bull. **1**: 691, *pl. 39.* 1896. (N. Am. Sept. 400, NY!).

Hypnum orbicularicordatum Ren. & Card., Bull. Herb. Boiss. **4**: 19. 1896; Bot. Gaz. **22**: 52, 53, *pl. 4. f. B.* 1896. (M. Am. Sept. 249, NY!)

Calliergon orbicularicordatum Broth., in E. & P. Nat. Pfl. **1** (3): 1037. 1908.

Calliergon cordifolium f. *intermedium* Grout, Moss Fl. N. Am. **3**: 97. 1931. (N. A. M. Pl. 209, NY!)

Calliergon giganteum var. *cyclophyllotum* Grout, Moss Fl. N. Am. **3**: 97. 1931.

Autoicous. Plants in deep soft masses, green or yellow-green, never reddish, the old stems brown; stems creeping or erect, 4–20 cm. (30 cm. in the aquatic phase) long, simple, with short branches, irregularly pinnately branched, or densely pinnately branched, often radiculose.

Stem leaves clasping the stem at intervals of 0.4–0.6 mm. (0.3–0.9 mm.), long decurrent at the auricles. lightly striate when dry, spreading or imbricated, concave, broadly lanceolate, triangular-lancolate or ovate, 2–3 × 1.2–1.5 mm. (1.6–5 × 0.8–2.8 mm.), usually twice as

long as wide but varying from 1 to 3 times as long as wide, obtuse and cucullate at apex; line of insertion of leaf widely or narrowly concave forming a cordate base when detached; margin entire, in the short-celled and aquatic phases inrolled to make leaf appear pointed; costa slender but distinct, ending 2–6 cells from apex, 60–80 μ (40–100 μ; 160 μ in aquatic phase) in diameter at base, tapering to 20 μ (40 μ in aquatic phase) at apex; 1 or 2 rows of wide, short cells along the costa at apex appear ladder-like; simple radicles invariably produced on some leaves along both sides of the costa at apex (rarely absent in the aquatic phase). Branch leaves similar to stem leaves but smaller.

Cells thin-walled, median leaf-cells linear, 8–10 × 60–100 μ (6 × 40 μ in short-celled phase); marginal cells at shoulder long and narrow, 4–6 × 80–160 μ; cells across entire base wide and short, alar cells hyaline, decurrent, 20–40 μ (60–120 (160) μ), extending to the costa on typical leaves, usually not sharply delimited from the large wide basal cells (more sharply delimited in the aquatic phase); cells at apex short and wide, 6–8 (10) × 20–40 μ.

Antheridial buds borne on primary stems; perigonial leaves oval, abruptly acuminate, ecostate; antheridia several, cylindric, 0.5–0.6 × 1 mm.; paraphyses of 6 cells about as long as antheridia. Perichaetium 3.5–4 mm. long, leaves costate, broadly lanceolate, abruptly long acuminate or filiform, irregularly serrate at apex, radicles frequent at apex; outer leaves broadly ovate, inner broadly lanceolate.

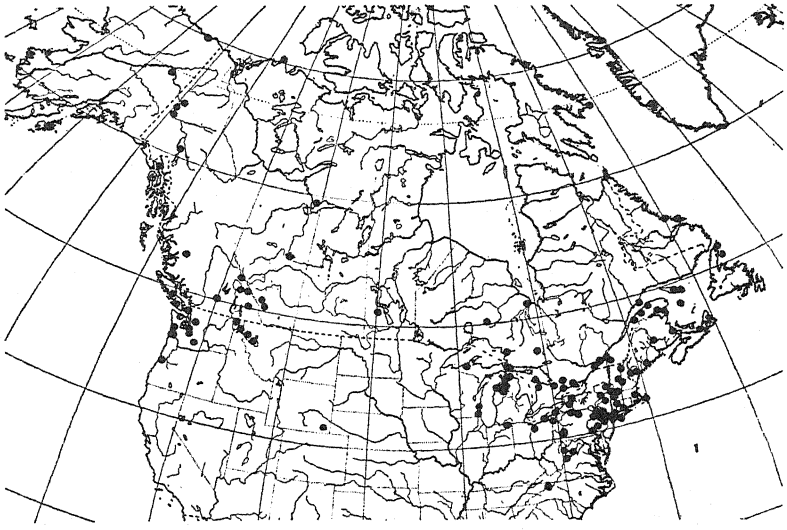
Seta 5–8 cm. long; capsule large, oblong, cernuous or horizontal, 1.8–2 × 2.5–3.5 mm.; operculum conic or abruptly apiculate, 0.4–0.7 mm. high; annulus lacking; outer peristome golden, inner peristome pale, cilia in 2's or 3's. Spores smooth, light yellow, 25 μ in diameter.

TYPE LOCALITY: Europe.

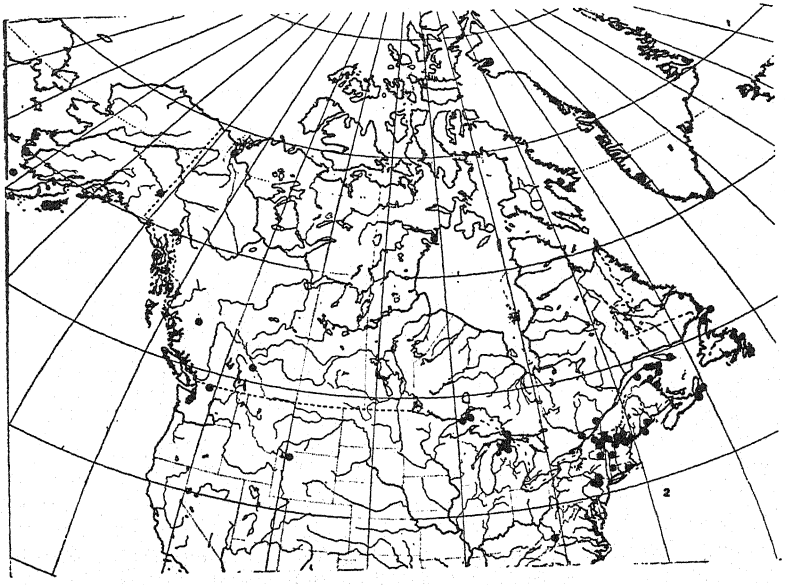
HABITAT: Swamps, bogs, beach pools, sluggish streams, ditches, sloughs, swales; often in calcareous places although apparently lime is not necessary.

GENERAL DISTRIBUTION: Circumpolar. In northern hemisphere throughout northern Europe, Asia, and North America. In southern hemisphere in New Zealand. In North America south to New Jersey, Pennsylvania, West Virginia, Ohio, Indiana, Wisconsin, Wyoming, and Washington. MAP 1.

EXSICCATI: MASSACHUSETTS: N. A. M. Pl. 40 (NY, TENN, CM, DUKE); Rel. Farlow. 585 (MICH). CONNECTICUT: N. A. M. Pl. 484 (BART, DUKE, WVA, OS, CM); N. A. M. Pl. 354 (DUKE, NY, OS, WVA, CM). MINNESOTA: N. E. Minn., July 16–Aug. 7, 1902 (NY); N. A. M. Pl. 209a (NY, TENN, CM, DUKE); N. Am. Sept. 400 (NY). WASHINGTON: N. A. M. Pl. 253a (DUKE, NY, WVA, OSU); N. A. M. Pl. 209 (DUKE, NY, TENN, CM); Cascade



MAP 1. The distribution of *Calliergon cordifolium* in North America.



MAP 2. The distribution of *Calliergon stramineum* in North America.

Mts. 127 (NY, TENN, DUKE); Cascade Mts. 138 (DUKE, NY). CANADA: ONTARIO: Can. Musci 361 (NY); Can. Musci 362 (NY); Can. Musci 919 (DUKE). NORTHWEST TERRITORIES: N. A. M. Pl. 370 (MO, NY); M. Am. Sept. 249 (NY). BRITISH COLUMBIA: N. A. M. Pl. 253 (DUKE, MICH, NY, TENN, CM). GENERAL: M. App. 441, 442, 443 (NY); M. Am. 209 (NY, TENN); M. Allegh. 34 (NY, MICH); M. Bor. Am. (ed. 1, 1856) 309, (ed. 2, 1865) 457 (NY); M. Bor. Am. (ed. 2, 1865) 458 (NY, DUKE, CM).

ILLUSTRATIONS: Bry. Eur. *pl. 615;* Pascher Süsswasser-Flora 14: 147, *f. 51 b;* short-celled phase p. 147, *f. 51c;* Limpricht, Laubm. Eur. (1904) 3: 553, *f. 432* (short-celled phase); Dixon, Handb. (1924) *pl. 60, f. I, J;* Jennings Mosses West. Penna. *pl. 40;* Braithwaite, Brit. Moss. *Fl. 3; pl. 96.*

2. CALLIERGON STRAMINEUM (Brid.) Kindb., Eur. & N. Am. Bryin. 81. 1896.

Hypnum stereodon stramineum Brid., Musc. Recent. **2** (2): 172. 1801.
Hypnum nivale Lorentz, Moosst. 122, *pl. 5 f. B.* 1864.
Amblystegium stramineum De Not., Atti Univ. Genova **1**: 137. 1869.
Hypnum stramineum var. *compactum* Milde, Bryol. Siles. 370. 1869.
Hypnum stramineum var. *nivale* Hartm., Skand. Fl. ed. 10. 5. 1871.
Hypnum stramineum f. *ovata* Boul., Musc. Fr. 11. 1884.
Hypnum stramineum var. *exiguum* Ren. in Boul., Musc. Fr. 584. 1884.
Amblystegium stramineum var. *nivale* Vent. & Bott., Enum. Critt. 10. 1884.
Calliergon nivale Kindb., Eur. & N. Am. Bryin. 81. 1896.

Dioicous. Plants in deep soft tufts, yellow-green or stramineous, the older portions dark; stems erect or ascending, 5–15 cm. long, simple or with a few short branches, without radicles.

Stem leaves clasping the stem at intervals of 0.2–0.5 cm., long decurrent at the auricles, plicate when dry, retaining one or two plications when wet, loosely or closely imbricate, concave, lanceolate or broadly linear 1.5–2 × 0.5–0.8 mm. (1–2.8 × 0.4–1.0 mm.), 2–3 times as long as wide, apex obtuse and cucullate, bearing tufts of radicles on the back; line of insertion of leaf truncate or broadly concave; margin entire; costa slender, 40 μ (20–60 μ) wide, 1–1.5 mm. (0.5–2.0 mm.) long, extending 0.5–0.8 the length of the leaf. Branch leaves similar to the stem leaves but smaller.

Cells thin-walled, median leaf cells linear, 6 × 40–60 μ (4–8 × 30–80 μ), larger at leaf-base, cells of margin at shoulder 10–20 μ shorter than the median leaf cells, alar cells 20 × 40–60 μ (20–40 × 20–80 μ) reaching half way to the costa, in mature leaves sharply delimited from the other basal cells and forming distinct, hyaline, decurrent auricles; cells at apex short and wide, 6 × 20 μ (4–10 × 20–40 μ).

Antheridial buds produced on the main stems of male plants; perigonial leaves ovate or broadly lanceolate, abruptly acuminate, ecostate; antheridia several, 4.5 × 0.1 mm., cylindric; paraphyses short or as long as the antheridia, of 3–5 cells. Perichaetium 4 mm. long, leaves abruptly acuminate, coarsely and irregularly serrate at apex, costa short or lacking; inner perichaetial leaves sheathing the base of the seta, lanceolate; outer perichaetial leaves ovate.

Seta 4–7 cm. long; capsules subcylindric or oblong, cernuous or horizontal, tapering at base, 1–1.5 × 2–3 mm., operculum apiculate 0.5 mm. high, annulus lacking, outer peristome yellow, inner peristome pale, cilia imperfectly developed. Spores finely papillose, yellow-green, 30 μ in diameter.

TYPE LOCALITY: Europe.

HABITAT: In cool bogs, swamps, and pools; tundra.

GENERAL DISTRIBUTION: Circumboreal. In northern hemisphere throughout northern Europe, Asia, and North America south to Massachusetts, Connecticut, Pennsylvania, Virginia, Michigan, Wyoming, and Washington. MAP 2.

EXSICCATI: VERMONT: N. A. M. Pl. 283 (NY, TENN, CM, DUKE). NEW JERSEY: Rel. Farlow. 592. CANADA: CAPE BRETON ISLAND: N. A. M. Pl. 457 (BART, DUKE, NY, MICH, TENN, MO, CM, OS). ONTARIO: M. Am. Sept. 345 (NY). BRITISH COLUMBIA: Can. Musci 913 (DUKE). YUKON: Can. Musci. 405, 353 (NY). GENERAL: M. Am. 210 (TENN, NY); M. Bor. Am. (ed. 1, 1856) 311 (NY); M. Bor. Am. (ed. 2, 1865) 460 (NY, CM); M. App. 547 Supp. 1 (NY); M. Alleg. 38 (NY); Can. Musci 473 (NY).

ILLUSTRATIONS: Bry. Eur. *pl. 617;* Pascher, Süsswasser Flora 14: 147, *f. 51 d;* Limpricht, Laubm. Eur. (1904) 3: 556, *f. 433;* Dixon, Handb. (1924) *pl. 60, f. F;* Braithwaite, Brit. Moss. Fl. 3: *pl. 97.*

3. CALLIERGON RICHARDSONI (Mitt.) Kindb., Eur. & N. Am. Bryin. 80. 1896.

Stereodon richardsoni Mitt., Jour. Linn. Soc. 8: 42. 1865. (*Richardson 439*, NY!)

Hypnum breidleri Jur., Hedwigia 14: 182. 1875. (*Breidler*, NY!)

Hypnum cordifolium var. *richardsoni* Husn. in Boul., Musc. Fr. 585. 1884.

Hypnum richardsoni Lesq. & Jam., Man. 404. 1884.
Amblystegium richardsoni Lindb., Musci Scand. 34. 1879.
Hypnum giganteum var. *labradorense* Ren. & Card., Bot. Gaz. 19: 240. 1894. (*Waghorne*, Battle Harbor, Labrador, NY!)
Hypnum subgiganteum Kindb., Ottawa Nat. 14: 80. 1900. (*Macoun*, Sask. Prince Albert, 1896, DUKE!)
Calliergon giganteum var. *labradorense* Grout, Check List 17. 1929.

Autoicous. Plants green, yellow-green, or golden, sometimes tinged with red or brown; stems ascending or creeping, 3–15 cm. long, simple or irregularly branched, occasionally pinnately branched, not radiculose.

Stem leaves clasping the stem at intervals of 3–5 cm., decurrent at the auricles, irregularly striate when dry, imbricated, slightly concave, ovate or lanceolate, 1.4–2.8 (4) × 0.6–1.8 mm., 2–3 times as long as wide, apex obtuse and cucullate; line of insertion of leaf broadly concave; margin entire, costa slender, 40–60 μ (20–80 μ) wide at base, 1–2.1 mm. long, extending 0.4–0.7 the length of the leaf. Branch leaves similar to stem leaves but smaller.

Cells thin-walled, linear; median leaf cells 6–8 × 60–80 μ (4–8 × 40–100 μ); cells of margin at shoulder 10–20 μ shorter than median cells; alar cells decurrent, 20–60 × 40–100 μ, reaching to within 4–6 cells of the costa, in mature leaves large, abruptly inflated, hyaline, orange, or brown, oriented in a different plane from the linear basal cells; cells at apex short and wide, 6–10 × 20–40 μ.

Antheridial buds numerous on primary stems; perigonial leaves broadly oval, abruptly acuminate, ecostate, 1.0–0.6 mm.; paraphyses of 6–8 cells, shorter than, rarely as long as, the narrowly cylindric antheridia. Perichaetium sheathing the base of the seta for 2–3 mm., leaves ecostate, lanceolate, gradually acuminate, 2.6–3 × 0.8–1.0 mm.

Seta 3–4 cm. long; capsule horizontal or cernuous, 3 × 1.5 mm.; operculum conic, apiculate, 1 mm. high; annulus lacking; outer peristome yellow, inner peristome pale yellow, cilia in 3's. Spores finely papillose, yellowish, 30 μ in diameter.

TYPE LOCALITY: "North America." Mitten says of Richardson's collection, "Supposed by Drummond to be from Great Bear Lake."

HABITAT: Bogs, swamps, pools, and sluggish streams.

GENERAL DISTRIBUTION: Circumboreal in northern North America and Europe. In North America south to Vermont, Pennsylvania, Michigan and Saskatchewan.

SPECIMENS EXAMINED: VERMONT: Willoughby, Annie Lorenz 37. (NY); Barnett, Blanchard (DUKE). PENNSYLVANIA: Dillerville Swamp, Lancaster Co., July 25, 1894, J. K. Small (DUKE). MICHIGAN: Isle Royale, July 9, 1910, W. S. Cooper 10 (DUKE). CANADA:

QUEBEC: Table Top Mountain, Gaspé Co., Aug. 7, 1906, J. F. Collins 4399, 4434, 4445 (BART). LABRADOR: Port Burwell, Nicholas Polunin 1082a-5 (MICH); Port Burwell, Sept. 25, 1936, Dutilly 1636, 1639, 1717 (MICH). SASKATCHEWAN: Prince Albert, June 30, 1896, J. Macoun 919a (DUKE). NORTHWEST TERRITORIES: Ellesmereland, 76° 20′ Lat., 81° 30′ Long. Sept. 6, 1936, Dutilly 1269 (DUKE); Chesterfield Inlet, 63° 25′ Lat., 90° 40′ Long., Dutilly 662, 663 (DUKE MICH).

Calliergon richardsoni has never been well understood and has been considered intermediate between or a part of *C. cordifolium*, *C. giganteum*, and *Calliergonella cuspidata*. After examination of the type in the New York Botanical Garden, I believe that *C. richardsoni* is not synonymous with any of these, but is a distinct species. The short single costa makes *C. richardsoni* distinctive from *C. cordifolium* with its percurrent costa and from *C. cuspidata* with its costa short and double, or lacking.

Occasionally, plants of *C. richardsoni* have the red or orange coloring of the leaves and alar cells characteristic of *C. sarmentosum*, but the thin, non-porose walls of *C. richardsoni* distinguish it quickly on microscopic examination.

Over half of the specimens identified as *C. richardsoni* proved to be *C. cuspidata*. Because no exsiccati of *C. richardsoni* have been issued, and because the species has been so thoroughly confused, all the specimens of *C. richardsoni* I have seen are listed above.

4. CALLIERGON SARMENTOSUM (Wahl.) Kindb.,
Eur. & N. Am. Bryin. 81. 1896.

Hypnum sarmentosum Wahl., Fl. Lapp. 380. 1812.
Hypnum trifarium f. *sarmentosum* Rab., Deuts. Krypt.-Fl. **2** (3): 290. 1848.
Stereodon sarmentosus Mitt., Jour. Linn. Soc. **1** (Suppl.): 110. 1859.
Amblystegium sarmentosum De Not., Atti Univ. Genova **1**: 136. 1869.
Hypnum sarmentosum var. *fallaciosum* Milde, Bryol. Siles. 369. 1869.
Hypnum sarmentosum var. *fontinaloides* Berggr. in Hartm., Skand. Fl. ed. 10. 4. 1871.
Hypnum sarmentosum var. *beringianum* Card. & Thér., Proc. Wash. Acad. Sci. **4**: 343. 1902. (*Trelease 1889*, MO!)
Hypnum hyperboreum Bryhn, 2nd Arc. Exp. Fram. **11**: 134. 1907. (DUKE!)

Calliergon subsarmentosum Kindb., Ottawa Nat. **23**: 137. 1909. (Macoun, Vancouver Island, DUKE!)
Calliergon sarmentosum var. *fallaciosum* Broth., Laubm. Fennosk. 489. 1923.
Calliergon sarmentosum var. *fontinaloides* Grout, Check List 17: 1929.
Calliergon sarmentosum var. *beringianum* Grout, Moss Fl. N. Am. **3**: 98. 1931.

Dioicous. Plants characteristically red, varying from red or orange to deep purple or black, sometimes variegated with green or yellow; stems erect or prostrate, 3–15 cm. long, simple, with short irregular branches near apex, or irregularly pinnately branched.

Stem leaves clasping the stem at intervals of 3 mm., smooth or irregularly plicate, usually retaining a few plications, long-decurrent at the auricles, spreading or slightly imbricated, lanceolate, 2–2.6 × 0.6–1.0 mm. (1–3 × 0.4–12 mm), three times as long as wide, cucullate at apex, with a fragile apiculus on young leaves; line of insertion widely concave; margin entire, costa single, distinct, 0.6–2.4 mm. long, extending 0.6–0.9 the length of the leaf, 40 μ (20–80 μ) wide at base.

All cells (except inflated alar cells) of mature leaves incrassate and porose; median leaf cells 6–8 × 60–100 μ; marginal cells at shoulder 4–6 × 60–80 μ; cells across entire base wider, incrassate, pitted and deeply colored brown or red, below the colored cells at the angles, a number of hyaline or orange, inflated, thin-walled cells form distinct, well defined auricles extending almost to the costa; cells at apex short and wide, 4–8 × 20–40 μ.

Antheridial buds borne on the main stems; perigonial leaves ovate or ovate-lanceolate, obtuse, short-costate; antheridia cylindric; paraphyses of 5–6 cells, exceeding the antheridia. Perichaetium sheathing, 4–4.5 mm. long, leaves costate, lanceolate, abruptly short acuminate or piliform, slightly serrate at apex.

Seta 4–5 cm. long; capsules small, cylindric, inclined or cernuous, 1.8–2.5 × 0.7–1.0 mm.; operculum rostrate, 0.6 mm. high; annulus lacking; outer peristome yellow, inner peristome paler, cilia in 2's or 3's. Spores smooth, yellow, 30 μ in diameter.

TYPE LOCALITY: Lapland.

HABITAT: In cold, quiet bogs, pools, streams.

GENERAL DISTRIBUTION: Circumpolar. In the northern hemisphere throughout northern Europe, Asia, and North America. In southern hemisphere Tierra del Fuego; Terre Louis Philippe; South Georgia; New Zealand; Mt. Kenia, E. Africa. In North America south to New England, Baffin Land, Colorado, and British Columbia. MAP 3.

EXSICCATI: NEW ENGLAND: M. Bor. Am. (ed. 1. 1856) 311b (NY); M. Bor. Am. (ed. 2, 1865) 461 (CM, NY, MICH). QUEBEC: N. A

M. Pl. 400a (BART, DUKE, NY, OS, WVA, TENN, MO, CM); Can. Musci 363 (NY). LABRADOR: N. A. M. Pl. 400b (BART, DUKE, NY, OS, MO, WVA, TENN, CM).

ILLUSTRATIONS: Bry. Eur. *pl. 616;* Pascher Süsswasser Flora 14: 147, *f. 51 e;* Dixon Handb. (1924) *pl. 60 K;* Braithwaite, Brit. Moss. Fl. 3: *pl. 96.*

5. CALLIERGON TURGESCENS (Schimp.) Kindb., Eur. & N. Am. Bryin. 84. 1896.

Hypnum turgescens Schimp., Syn. 648. 1860.
Hypnum molle turgescens Hartm., Skand. Fl. ed. 9, part 2. 6. 1864.
Stereodon turgescens Mitt., Jour. Linn. Soc. **8**: 42. 1865.
Amblystegium turgescens Lindb., Musci Scand. 33. 1879.
Drepanocladus turgescens Broth., in E. & P. Nat. Pfl. **1** (3): 1035. 1909.

Dioicous. Plants robust, in dense tufts, growing tips soft green to golden, olive or black, 3 mm. in diameter, old stems brown; stems erect, tumid, uneven in diameter, 6–20 cm. long, simple or with short irregular branches which are sometimes dichotomous.

Stem leaves clasping the stem at intervals of 0.3–2.1 mm., decurrent at the small auricles, striate when dry, closely imbricate, erect or spreading, deeply concave or spoon-shaped, ovate or broadly lanceolate, 1.8–3.2 × 0.7–1.5 mm., about 2.5 times as long as wide, cucullate and obtuse at apex with a fragile, minute, recurved apiculus always present on young leaves, narrowed at base to a shallowly concave or truncate line of insertion; margin entire; costa slender, double, 20–40 μ wide at base, extending 0.3–0.5 the length of the leaf.

All leaf cells incrassate and pitted; tinged brown; median leaf cells linear with thickened walls, 6–8 × 60–80 μ; cells at base with strongly thickened and porose walls; at the angles numerous wide, rectangular or quadrate cells form indistinct auricles; cells at apex short and wide, 4–8 × 40 μ, not incrassate.

Fruit found twice in Sweden, never in this hemisphere. Vegetative reproduction is by means of easily detached leafy buds formed in the axils of the stems and branches.

TYPE LOCALITY: Herjedal, Sweden.

HABITAT: Cold, calcareous bogs, swamps, marshes, ponds.

GENERAL DISTRIBUTION: Circumboreal. In northern Asia, Europe, and North America south to Greenland; Spitzbergen; British Isles; Central Europe; Siberia; Newfoundland; coast of Hudson Bay; Bruce Peninsula and Owen Sound, Ontario; Yukon; Rocky Mountains, Bernard Straits, Northwest Territories; Davis Straits, Alaska. Rare. MAP 3.

EXSICCATI: Can. Musci 401, 483 (NY).
ILLUSTRATIONS: Dixon, Handb. (1924) *pl. 60 H.*

6. CALLIERGON TRIFARIUM (Web. & Mohr) Kindb.
Eur. & N. Am. Bryin. 85. 1896.

Hypnum trifarium Web. & Mohr, Nat. Reise Schwed. 177, *pl. 2, fig. 2 a–d.* 1804.
Hypnum Stereodon trifarium Brid., Bryol. Univ. 2: 567. 1827.
Amblystegium trifarium De Not., Atti Univ. Genova 1: 138. 1869.

Dioicous. Plants yellow- or olive-green at the tips, brown or black below; stems prostrate or ascending, rigid and brittle, 8–20 cm. long, simp e with a few short branches.

Stem leaves clasping the stem at intervals of 0.3–0.4 mm., decurrent at the auricles, delicately striate when dry, regularly and closely appressed and imbriated in 3 rows to form a characteristically terete and cylindrical or triangular stem, deeply concave, widely ovate or elliptic, 1–2.6 × 0.5–1.8 mm., 1.5 to 3 times as long as wide, widest near the middle, broadly obtuse and cucullate at apex, line of insertion widely concave; margin entire, costa single, distinct, varying in length from half the length of the leaf to almost percurrent, 40 μ (30–60 μ) wide at base.

Cells linear, vermicular, median leaf cells incrassate, 6 × 60 μ (6 × 60–80 μ); marginal cells at shoulder similar, 6 × 40–80 μ; basal cells large hyaline or yellow, 20–40 × 60 μ (20–40 × 40–100 μ), decurrent, slightly inflated, forming either poorly delimited groups extending to within a few cells of the costa, or several rows of large cells across entire base; cells at apex not appreciably shorter, 6 × 40–60 μ.

Not found fruiting in North America.

TYPE LOCALITY: Sweden.

HABITAT: In cool calcareous swamps, marshes, bogs, pools, often associated with *Scorpidium scorpioides, Drepanocladus revolvens,* and *Calliergon turgescens;* rare, but locally abundant.

GENERAL DISTRIBUTION: Circumboreal in northern Europe, Asia, and North America, south to Scotland, Denmark, the Alps, Siberia, Connecticut, Ohio, Ontario, Michigan, British Columbia and Washington. MAP 3.

EXSICCATI: CONNECTICUT: N. A. M. Pl. 350 (DUKE, NY, OS, WVA, MO, TENN.). OHIO: M. Bor. Am. (ed. 1, 1856) 312 (NY, MICH); M. Bor. Am. (ed. 2, 1865) 462 (NY, MICH). ONTARIO: Can. Musci 365 (NY). GENERAL: M. Alleg. 39 (NY, MICH); Great Bear Lake, M. Am. 211 (NY).

ILLUSTRATIONS: Bry. Eur. *pl. 618;* Pascher Süsswasser Flora 14: 147, *f. 51 f;* Dixon, Handb. (1924) *pl. 60 G;* Braithwaite, Brit. Moss Flora *pl. 97.*

EXCLUDED SPECIES

CALLIERGON GIGANTEUM Kindb.,
Eur. & N. Am. Bryin. 80. 1896.

Hypnum cordifolium β *fasciculatum* De Not., Syll. Musc. 44. 1838.
Hypnum cordifolium var. *fluitans* Rab., Deuts. Krypt-Fl. **2** (3): 289. 1848.
Hypnum cordifolium var. *robustum* H. Klinggr., Hoeher. Crypt. 187. 1858.
Hypnum cordifolium var. *stenodictyon* Bry. Eur. 6 (fasc. 57–61): 47. 1854.
Hypnum giganteum Schimp., Syn. 642. 1860.
Stereodon giganteus Mitt., Jour. Linn. Soc. **8**: 43. 1865.
Amblystegium giganteum De Not., Atti Univ. Genova **1**: 135. 1869.
Hypnum cordifolium var. *giganteum* Sanio, Sahlenverh. 84. 1882.
Hypnum giganteum var. *fluitans* Klinggr., Leb.- und Laubm. W. und Ostpreuss. 292. 1893.
Hypnum giganteum var. *dendroides* Limpr. in Rab., Krypt.-Fl. **4** (3): 555. 1899.
Hypnum giganteum var. *brevifolium* Limpr. in Rab., Krypt.-Fl. **4** (3): 555. 1899.
Calliergon giganteum var. *fluitans* Klinggr., Leb.- und Laubm. W. und Ostpreuss., 292. 1893.
Calliergon giganteum var. *dendroides* Grout, Check List 17. 1929.

The characters which have been used to distinguish *C. giganteum* from *C. cordifolium* are its dioicous inflorescence, robust habit, pinnate branching, large leaves, narrow leaf cells, and hyaline, inflated, well-defined auricles. All of these characters are variable and unreliable as several students, including Dixon, have realized. In the past, bryologists have recognized that the two species are closely related. From 1838 to 1860, the robust plant was considered merely a variety of *C. cordifolium.* In 1865 Mitten said of *Stereodon giganteus:* "This is the species distributed as H. cordifolium by Drummond No. 209, but all the American examples are more slender than the European specimens." Drummond's No. 209 proves to be fairly typical *C. cordifolium* with some pinnately branched stems.

I believe that the plants which have been called *C. giganteum* are merely variations of *C. cordifolium.* Apparently *C. cordifolium* is

similar to *Drepanocladus aduncus*, *D. fluitans*, and *D. exannulatus* in its fundamental variation. *C. cordifolium*, like the three species of *Drepanocladus*, produces an aquatic phase and a short-celled phase under different environmental conditions.

The aquatic phase has been called *C. giganteum*. Although *C. giganteum* was originally described as "robustum . . . dense pinnato-ramulosus . . . Folia caulina magna, patentia, late cordato-ovata, ad angulos defluentes valde excavata hyalina, costa ad apicem fere continua viridi, reti solidiusculo lineari ad angulos excavatos subito dilatato-quadrato . . . " no measurements of any sort were given. Leaves of pinnately branched plants vary in length from 1.5 to 5 mm. Since leaves of typical *C. cordifolium* are 2–3 × 1.2–1.5 mm., the size of leaves and plants is a useless character. Pinnate branching is so inconstant that clumps in which most of the plants are pinnate usually have several less branched or simple stems. In addition, typical *C. cordifolium* varies toward pinnate branching and pinnate stems are frequently found among the simple stems of *C. cordifolium*. Variation in branching is so great, in fact, that a stem may be simple for part of its length, then abruptly become pinnately branched in response to changed environmental conditions. The areolation, too, is variable, so that many pinnately branched plants have the poorly delimited auricles associated with *C. cordifolium*, whereas robust leaves from simple stems often have suddenly enlarged, hyaline, inflated alar cells. This character varies on a single stem; leaves from an unbranched part of a stem usually have a poorly delimited alar region, while leaves from the pinnately branched part of the same stem have abruptly inflated alar cells. Even the inflorescence is variable, as typical *C. cordifolium* produces only antheridial buds on some stems.

It is therefore apparent that robust habit, pinnate branching, inflated alar cells and a dioicous inflorescence are not always associated on the same plant, and are continuously intergrading characters. As a result, these are useless in distinguishing species. Actually, these characters vary in response to changes in the environment, and are produced in various combinations by an excess of water in the environment. The same conditions that produce the aquatic phase of *D. aduncus* produce the aquatic phase of *C. cordifolium*, as the two are often found growing together. Consequently, I give no formal taxonomic recognition to these variations, considering them merely an aquatic phase of *Calliergon cordifolium*.

The short-celled phase is most commonly produced on plants which are partly the aquatic phase and has been usually identified as *C. giganteum*. Leaves with short cells are broadly lanceolate, ovate, or broadly deltoid, 1 : 1–1.5 with median leaf cells 6–8 × 40–60 μ. The stems vary from pinnate to simple in the same clone. Examination of the type of *Hypnum cyclophyllotum* Holz. reveals that it is the short-celled phase of *C. cordifolium* with the characteristically percurrent costa bearing radicles from the apex; it was described as distinct only because of its broadly deltoid leaves and short cells. The original figures and type material of *H. orbicularicordatum* Ren. & Card. indicate that it too is the short-celled phase of *Calliergon cordifolium*. Although only a single leaf of the type collection was found bearing radicles from the apex of the costa, other characters of the costa and leaf are harmonious with *C. cordifolium*. The cells are short and the leaves are broadly deltoid as is common in the short-celled phase of *C. cordifolium*. In spite of the fact that the original description states "costa thin, vanishing far from the apex," one leaf figured shows the costa nearly percurrent, and the majority of the leaves I examined had a costa which stopped six cells from the apex. A ladder-like row of cells characteristic of *C. cordifolium* bordered the costa. These two names which have been proposed for the short-celled phase of *C. cordifolium*, have fortunately been little used.

When it is understood that these variations are merely environmental, then they can be treated as part of a single large variable species, *C. cordifolium*, which is easily distinguished by the constantly percurrent costa.

CALLIERGON PSEUDO-SARMENTOSUM (Card. & Thér.) Broth., in E. & P. Nat. Pfl. ed. 2. **11**: 348. 1925.

Hypnum pseudo-sarmentosum Card. & Thér., Univ. of Calif. Pub. Bot. **2**: 305, *pl. 27, f. 2.* (*Setchell et al.* Alaska, DUKE!).

Examination of a portion of the type convinces me that this is *Drepanocladus exannulatus* (Bry. Eur.) Warnst. The general facies and color of the plant, the slightly falcate-secund apiculate buds, the apex, costa, and areolation of the leaves, and the perichaetial leaves are characteristic of *D. exannulatus*. The specimen which I examined consisted only of the tips of stems, so that the leaves were all fairly young. The margin of these leaves appears entire on first examination, but several leaves show serrulations; I believe the older leaves would have the distinct serrulations characteristic of *D. exannulatus*.

It is difficult to understand why this plant, with its acute or acuminate apices, was ever placed in the genus *Calliergon* where all the species are obtuse or cucullate at the apex. Even ignoring this difficulty, the specimen does not have the incrassate and porose basal cells of *C. sarmentosum* and its close relatives.

PLEUROZIUM Mitt., Jour. Linn. Soc. **12**: 537. 1869.

Hypnum δ *Pleurozium* Sull., Musci U. S. 68. 1856.
Stereodon Mitt., Jour. Linn. Soc. **1**: Suppl. 110. 1859.
Hylocomium B. Pleurozium Lindb., Musci Scand. 37. 1879.
Hylocomium subg. B. *Hypnopsis* Limpr. in Rab., Krypt. Fl. **4**: 587. 1888.
Hylocomium IV. *Hypnopsis* II. *Pleurozium* Kindb., Eur. & N. Am. Bryin. 39, 41. 1896.

Dioicous. Plants robust in deep loose masses, dark green to olive or stramineous, shining; stems prostrate or erect, without rhizoids or paraphyllia, usually regularly pinnately branched but varying from simple to densely branched and bushy, showing a central strand in cross section; apical buds of stems and branches straight, pointed, shining. Branches recurved, produced in one plane and forming a pinnate frond.

Leaves crowded, concave, irregularly plicate, entire except at apex, broadly oval or elliptic, broadly obtuse or abruptly narrowed to an obtuse, crenulate, rounded apex; costa short and double, often weak and faint.

Median leaf cells linear, thin-walled; basal cells incrassate, porose, colored red, yellow, or orange; at the angles a clearly defined group of enlarged quadrate or rectangular, hyaline or colored cells.

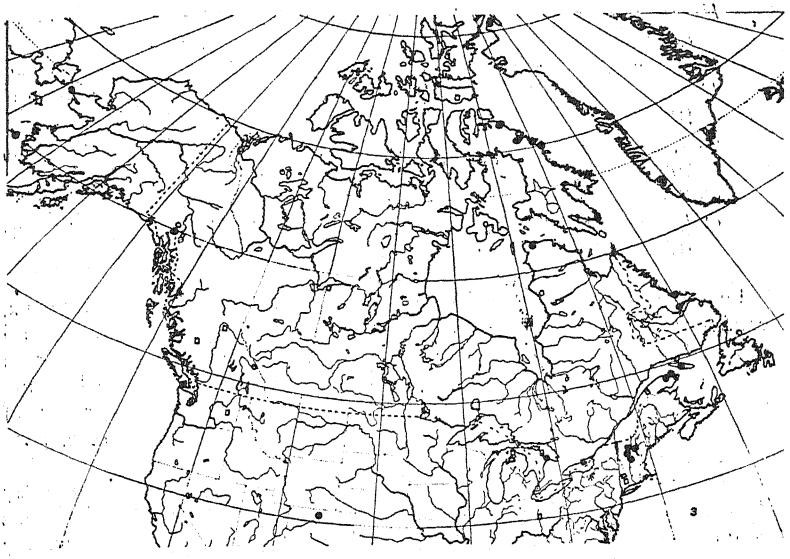
Antheridial buds borne on the primary stems; perigonial leaves oval, acute, ecostate. Perichaetium sheathing the base of the seta; inner perichaetial leaves long, lanceolate, ecostate, erect, entire, sharply acuminate.

Seta 2–5 cm. long, reddish or reddish-brown, capsule inclined to horizontal, cylindric, symmetric, slightly contracted under the mouth when dry; annulus not differentiated; operculum conic or apiculate; peristome perfect, outer peristome yellow, inner peristome pale, cilia in 3's. Spores papillose, 40 μ in diameter.

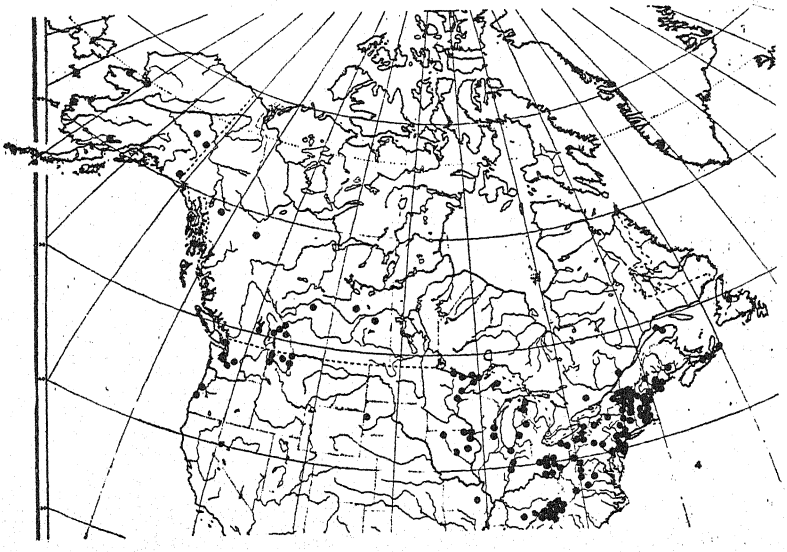
Type species—*Hypnum schreberi* Brid.

PLEUROZIUM SCHREBERI (Brid.) Mitt., Jour. Linn. Soc. **12**: 537. 1869.

Hypnum schreberi Brid., Musc. Recent. **2** (2): 88. 1801.
Hypnum curlandicum Brid., Musc. Recent. Suppl. **4**: 160. 1819.
Hypnum schreberi β *curlandicum* Brid., Bryol. Univ. **2**: 421. 1827.
Stereodon schreberi Mitt., Jour. Linn. Soc. **1** (Suppl.): 110. 1859.



MAP 3. The distribution of *Calliergon sarmentosum* (dots), *C. trifarium* (squares), and *C. turgescens* (circles) in North America.



MAP 4. The distribution of *Pleurozium schreberi* on North America.

Hypnum chimborazense Mitt., in Spruce Cat. 15. 1867. (*Spruce 1032*, NY!).
Hylocomium schreberi De Not., Atti Univ. Genova **1**: 92. 1869.
Hylocomium parietinum Lindb., Acta. Soc. Sci. Fenn. **10**: 251. 1872.
Cuspidaria morenoi C. Müll., Hedwigia **36**: 131. 1897. (*Moreno 593*, NY!)
Calliergonella schreberi Grout, Moss Fl. N. Am. **3**: 103. 1931.
Calliergonella schreberi var. *tananae* Grout, Moss Fl. N. Am. **3**: 103. 1931.

Dioicous. Plants in large, deep loose mats or tufts, stramineous, yellow-green or olive-green, glossy and shining; stems erect, stiff, and rigid, stout, bright red, 5–15 cm. long, variable in branching from densely pinnate, appearing almost bushy, regularly pinnate forming large fronds, to almost simple, sometimes pinnate at the lower part of the stem but simple at the long termination. Branches terete, julaceous, often recurved.

Stem leaves clasping the stem at intervals of 0.6 mm., slightly decurrent, lightly plicate when dry, retaining one or two plications when wet, erect, imbricated and sheathing, glossy, concave, widely oval or elliptic, 1.6–3 × 0.8–1.6 mm., obtuse and abruptly rounded with a few minute crenulations at apex, line of insertion of leaf narrowed, angular, not rounded; margin entire, incurved in the upper half; costa double, 0.4 mm. long, or very short and faint. Branch leaves narrowly oblong and more abruptly pointed at apex.

Median leaf cells thin-walled, linear 6–8 × 60–80 (120) μ, marginal cells at shoulder shorter and narrower, 6 × 40–80 μ, basal cells somewhat incrassate and porose, walls nodulose at least on the inner surface, a clearly defined group at the angles somewhat enlarged, rectangular, hyaline or more usually orange, red, or brown, 10–20 × 20–50 μ; cells at apex wide and short, 8–10 (20) × 20–30 (40) μ.

Antheridial buds borne on the primary stems. Perigonial leaves oval, acute, ecostate. Antheridia broadly oval, paraphyses of 5–8 cells, longer than the antheridia. Perichaetium 3–5 mm. long sheathing the base of the seta, leaves lanceolate, abruptly acuminate, ecostate, entire.

Seta 2–5 cm. long, red or chestnut, capsule oblong, subcylindric, reddish, cernuous, 1 × 2 mm.; operculum conic, 1 mm. high, annulus lacking; outer peristome golden, inner peristome yellow, cilia in 3's. Spores yellowish, papillose, 40 μ in diameter.

TYPE LOCALITY: Europe.

HABITAT: Damp woods, swamps, or margins of bogs; even tolerating fairly dry and exposed places.

GENERAL DISTRIBUTION: Widespread and common in Europe, Asia, and North America; Newfoundland to Alaska south to North Carolina,

Tennessee, Missouri, Iowa, Montana, Idaho, Oregon. Southward in the Cordilleran ranges to Costa Rica, Colombia, Ecuador, Peru, and Patagonia. MAP 4.

ILLUSTRATIONS: Bry. Eur. *pl. 620;* Dixon, Handb. (1924) *pl. 61 A;* Jennings, Mosses West. Penna. *pl. 44;* Braithwaite, Brit. Moss Fl. 3: *pl. 110* (*Hylocomium parietinum*).

EXSICCATI: VERMONT: N. A. M. Perf. 35 (OSU, WELCH, TENN, CM, NY); N. A. M. Pl. 45 (TENN, CM, DUKE, NY); Hand Lens Mosses 76 (NY). IDAHO: M. Leib. 168 (NY). WASHINGTON: Cascade Mts. 129 (DUKE). CANADA: PRINCE EDWARD ISLAND: Can. Mosses 409 (NY). BRITISH COLUMBIA: N. A. M. Pl. 45a (TENN, CM, DUKE, NY); Selkirk Fl. 839 (CM). ALASKA: N. A. M. Pl. 479 (OSU, WVA, CM, DUKE, NY). GENERAL: M. Am. 208 (TENN, NY); M. Bor. Am. (ed. 2, 1865) 455 (CM, NY); M. Bor. Am. (ed. 2, 1865) 456 (CM, NY); M. Bor. Am. (ed. 1, 1856) 308 (NY); M. Bor. Am. (ed. 1, 1856) 308b (NY); M. Alleg. 33 (NY); Can. Musci 364 (NY); M. App. 455 (NY).

CALLIERGONELLA Loeske, Hedwigia 50: 248. 1911.

Acrocladium sp. Lindb., Musci Scand. 39. 1879.
Calliergon III *Pseud-Acrocladium* Kindb., Eur. & N. A. Bryin. 81. 1897.

Dioicous. Plants robust, somewhat rigid, glossy, in deep tufts, green, yellow-green, yellow, or golden; stems ascending or erect, usually pinnately branched, occasionally simple, without rhizoids but with pseudoparaphyllia in the axils of the branches, outer layer of cortical cells large, thin-walled, hyaline, small central strand present; apical buds cuspidate, stiff.

Leaves erect and imbricated, slightly plicate, concave, broadly oval or lanceolate, apex obtuse, cucullate and broadly rounded or short apiculate; margin entire, ecostate or with a short, double costa.

Cells narrowly linear, wider and incrassate at the leaf-base, alar cells abruptly inflated, hyaline or brown, thin-walled, forming sharply defined decurrent auricles.

Antheridial buds numerous on the primary stem; perigonial leaves oval, acute, ecostate. Perichaetium erect, sheathing, perichaetial leaves lanceolate, entire, sharply acuminate, plicate, ecostate.

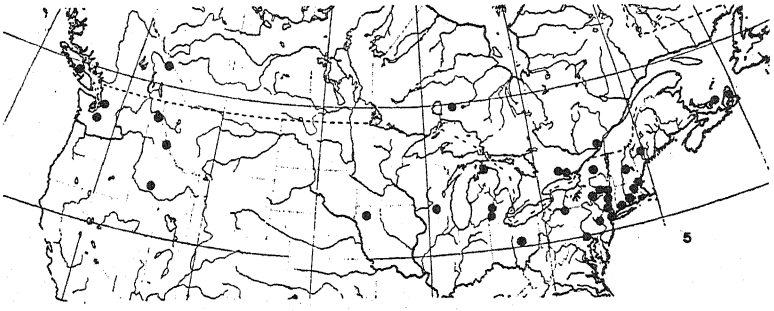
Seta reddish, capsule cylindric, horizontal; operculum conic or apiculate; annulus dehiscent; peristome perfect, outer peristome golden, inner peristome yellow; cilia in 3's. Spores rough, yellow, 32 μ in diameter.

TYPE SPECIES: *Hypnum cuspidatum* Hedw.

CALLIERGONELLA CUSPIDATA (Hedw.) Loeske,
Hedwigia 50: 248. 1911.

Hypnum cuspidatum Hedw., Sp. Musc. 254. 1801.
Hypnum flexile Brid., Bryol. Univ. **2**: 417. 1827.
Hypnum Stereodon cuspidatus Brid., Bryol. Univ. **2**: 562. 1827.
Stereodon cuspidatus Mitt., Jour. Linn. Soc. **8**: 42. 1865.
Acrocladium cuspidatum Lindb., Musci Scand. 39. 1879.
Calliergon cuspidatum Kindb., Eur. & N. A. Bryin. 81. 1897.

Dioicous. Plants robust in loose masses or tufts, glossy, green, yellow-green, stramineous, or golden brown, the lower parts of the stems brownish; stems rigid, erect or ascending, green or brown, 6–20 cm. long, varying from simple to regularly pinnately branched. Apical buds of branches and stems shining, cuspidate and terete because of the convolute apical leaves.



MAP 5. The distribution of *Calliergonella cuspidata* in North America.

Stem leaves clasping the stem at intervals of 3–6 cm., narrowed at the insertion, decurrent at the auricles, erect or sheathing, lightly plicate, concave, oval, elliptic, or broadly lanceolate, 0.8–2 × 1.6–2.8 mm., obtuse and cucullate at the broad, rounded apex, often with a short apiculus, line of insertion of leaf forming a cordate base when detached, margin entire, costa lacking or short and double, 3.5–6 mm. long, 20 μ wide at base. Branch leaves smaller and narrower, oval or lanceolate, more spreading, and slightly pointed.

Median leaf-cells thin-walled, narrow, linear-vermicular, fairly uniform throughout the leaf, 6 × 80–120 μ, somewhat shorter at apex and base, 6 × 60–80 μ, walls of basal cells incrassate, alar cells abruptly inflated, hyaline or reddish, hexagonal, thin-walled, 20–40 × 60–80 μ forming well defined decurrent auricles.

Antheridial buds borne on the primary stems, antheridia lanceolate, cylindric; perigonial leaves ovate, ecostate; paraphyses of 5–8 cells, onger than the antheridia. Perichaetium 4–6 mm. long, sheathing the base of the seta, inner leaves long lanceolate or linear, deeply plicate, gradually acuminate, entire, ecostate.

Seta 5–7 cm. long, reddish, capsule subcylindric, horizontal or inclined, 3–4 × 2 mm., operculum conic or minutely apiculate, 0.5–1 mm. high, annulus triseriate, dehiscent, peristome perfect, outer peristome golden yellow, inner peristome yellow; cilia in 3's. Spores rough, yellowish, 32 μ in diameter.

TYPE LOCALITY: Europe.

HABITAT: Damp places, often in standing water, bogs, swamps, marshes, wet meadows, ditches.

GENERAL DISTRIBUTION: Southern Canada and northern United States south to New Jersey, Pennsylvania, Ohio, Wisconsin, Iowa, Idaho, Washington. MAP 5.

ILLUSTRATIONS: Bry. Eur. *pl. 619;* Pascher Süsswasser-Flora 14: 147, *f. 51 a;* Limpricht, Laubm. Eur. (1904) 3: 568. *f. 434.* Dixon, Handb. (1924) *pl. 60 L;* Jennings Mosses West. Penna. *pl. 40;* Braithwaite, Brit. Moss. Fl. 3: *pl. 118.*

EXSICCATI: MASSACHUSETTS: N. A. M. Pl. 100 (NY, TENN). OHIO: M. Alleg. 32 (NY). WASHINGTON: Cascade Mts. 128 (NY, TENN), Cascade Mts. 129 (NY). CANADA: QUEBEC: N. A. M. Pl. 353 (OSU, WVA, TENN, NY, MO). BRITISH COLUMBIA: N. A. M. Pl. 90 (TENN, NY), Can. Mosses 408. GENERAL: M. App. 444 (NY); M. Bor. Am. (ed. 2, 1865) 454 (NY); M. Bor. Am. (ed. 1, 1856) 307 (NY).

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THE NEW YORK BOTANICAL GARDEN

RECENT LITERATURE ON MOSSES

MARGARET FULFORD

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UNIVERSITY OF CINCINNATI

REVIEW

HENRY S. CONARD. How to Know the Mosses. 1–166. *362 figs.* Wm. C. Brown Co., Dubuque, Iowa. 1945. (Spiral binding with paper cover, $1.50; cloth binding, $2.50.)—The author of this neat little book needs no introduction here since he is not only a well-known botanist and bryologist, but also at present the President of the Sullivant Moss Society. It would have been difficult to find a better qualified person to contribute this addition to Professor H. E. Jaques' popular "Pictured-Key Nature Series."

The major part of the text consists of keys interspersed with brief comments on species and groups of species, which are cleverly illustrated by means of small pen-and-ink drawings prepared by Professor Louisa Sargent of Grinnell College. Although simple and somewhat diagrammatic, these drawings give a good idea of the salient features of each species. The introductory chapters and even the index are abundantly illustrated with her sketches. In addition, several unnumbered decorative drawings and cartoons are used as end-pieces.

After an inviting introduction follow several short chapters whose headings are self-explanatory: "About Mosses," "How to Study Mosses," "What to Look for in Liverworts," "Books and Specimens as Means of Identification of Mosses and Liverworts," and "Using the Keys." Following the pictured key, which forms the body of the book, is a "Systematic List of Mosses and Liverworts," designed for use as a check-list and an outline of classification. Nearly four hundred mosses and over one hundred liverworts are listed.

Dr. Conard's style of writing is clear, concise, and authoritative, and illustrates convincingly some of the reasons for his fame as a teacher. He has simplified the complex vocabulary of professional botanists to such an extent that intelligent high-school students can use this book with facility.

The book is more comprehensive than the title indicates, at least in ordinary American usage, since illustrated keys are furnished for more than a hundred species of Hepaticae. It is unfortunate that this fact was not indicated in naming the book, since with its present title the work is certain to be confused by librarians and others with Mrs. Elizabeth M. Dunham's "How to Know the Mosses," published in 1916. There are so few American books dealing with bryophytes that duplication of titles is unnecessary.

Biologists may disagree with Dr. Conard's derivation of the term "liverwort" (page 10), since this word was in common usage centuries before the cellular structure of an animal's liver was discovered. For example, a quaint account of the properties of "Stone Liverwort" was published in 1578 by Dodoens in "A Niewe Herball."

Typographical errors are amazingly few, especially for a book printed by a photolithographic process, which gives less opportunity for proofreading. This method has the great advantage, however, that any number of illustrations may be reproduced without extra

cost. Very few consistent misspellings of specific names were noted, as of *Brachythecium salebrosum* (pages 87, 142), and *Pallavicinia Lyellii* (pages 116, 153). These are small matters which in no way mar the appearance of the book or its utility, and Dr. Conard is to be congratulated on the high standard of accuracy which he has maintained.—W. C. S.

RANGE OF MNIUM HORNUM

O. E. JENNINGS

I was much interested in Cain's map showing the distribution of *Mnium hornum* and his explanation:[1] "*Mnium hornum*, which has its greatest frequency in the northern coastal plain."

At the time I published my Manual of the Mosses of Western Pennsylvania (1913) I had not collected the moss in that part of Pennsylvania. Later, however, I found it rather common among shaded, moist rocks at Ohio Pyle, towards the southern border of the region, and then various of us began to find it in similar habitats northwards along the Allegheny Plateau until, now, we have it from twelve counties, all the way from West Virginia and western Maryland to New York State. I am now beginning to think of the species as a characteristic and fairly common moss of moist, shaded, rocky habitats throughout this region in ravines and protected valleys.

Mr. Charles Boardman collected it, July 19, 1934, Old Killarney Road, Lac Mercier, Terrebonne Co., Quebec, northwest of Montreal, this being a further extension of its northern inland range, and more or less in line with the Allegheny Plateau.

Perhaps the greater number of known stations for this moss along the coastal plain is due rather to more assiduous collecting and a larger number of collectors than to its real occurrence—just another argument for more detailed local work.

May I suggest that the distribution of *Mnium hornum* up the east and west sides of the Appalachians parallels that of various flowering plants that apparently spread northwards in post-glacial time from their more southern glacial preserve.

CARNEGIE MUSEUM

[1] Cain, Stanley A. Foundations of Plant Geography, p. 166. 1944.

CETRARIA ISLANDICA (L). ACH. ON LONG ISLAND, N. Y

ROY LATHAM

In THE BRYOLOGIST, volume 47, September, 1944, *Cetraria islandica* was reviewed with reference to its occurrence on Long Island. This article prompts me to publish the complete records of the localities where I have personally collected this species on Long Island.

My observations of lichens started in 1910 and continued with regularity until 1930 and intermittently thereafter until the present time.

During the period of observation nine localities and 13 stations for this species have been mapped on the eastern half of the island.

The locality named is the approximate nearest P. O. and the stations are where the various colonies were situated. The date is when the record was first made.

Orient: The extreme eastern locality of the north fork of Long Island, two stations. One on the asummit of Brown's Hill, altitude 118 feet, the highest point in this vicinity, a small bed about three by four feet. Station two in Orient, Long Beach (now the Orient Beach State Park), a small colony three by five feet. This station is a flat sandy coastal strip lying between Gardiner's Bay on the south and Long Beach Bay on the north. It is vegetated with beach plum, *Prunus maritima* Wang., bay-berry, *Myrica carolinensis* Mill., post oak, *Quercus stellata* Wang., pitch pine, *Pinus rigida* Mill. and red cedar, *Juniperus virginiana* L., the last low and spreading and some at least a century old. The colony in this station was destroyed in the hurricane of September 21, 1938, when the beach was flooded with salt water to a depth of four feet. The region, which had been abundantly covered with the Cladoniaceae, was washed practically bare of this family of lichens and the tree forms were mostly washed or blown away. It is of interest to note that the last abnormal flood tide which completely inundated this stretch of beach was September, 1815. It would appear then that the colony of *Cetraria* recorded at this station was established during the intermediate long period of 123 years between 1815 and 1938. The hurricane in September of 1944 again flooded this area with devastating results. The Cladoniaceae had made a fair recovery between 1938 and 1944, but there was no evidence of the *Cetraria*. If the park does not interfere, future botanists may again record the Iceland moss on Long Beach.

Other localities on the north fork of the island:

Southold: Horton's Beach, about 15 miles west of Orient, 1914. A small colony on beach plum barrens near the Sound. This colony was completely destroyed in the hurricane of September 15, 1944.

Cutchogue: About midway of the north fork, 1923. A small bed less than two by three feet on a bare hilltop near the Sound.

Riverhead: Roanoke, near the Sound, 1928. A few scattered plants on the top of a high sand dune. This station is just west of the north fork.

Wading River: 1918. A few plants on summit of a high hill with exposure to the Sound.

Calverton: 1936. In the pine barrens south of the Peconic River, a small colony on a hilltop sparingly wooded with Shrub Oak, *Quercus ilicifolia* Wang.

Localities on the south fork of the island:

Montauk: Two stations. One directly east of Great Pond (Lake Montauk), 1925, on a barren hilltop, several small patches. The second station is situated northwest of Fresh Pond near Napeague Bay, 1926, a small patch in sandy beach plum habitat near the sea.

Southampton: Shinnecock Hills, 1926. Three colonies. One on Sugar Loaf Hill, elevation 142 feet, two very small beds; one of the colonies is on a lower hilltop; the third colony is in a sheltered gully between hills and contains the largest plants I have examined on Long Island.

Gardiner's Island, 1916. Summit of a high hill on the east side of this island, a colony three by seven feet.

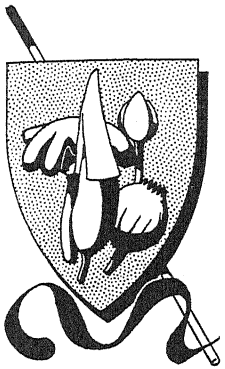
The Shinnecock hills and north fork colonies are the only ones checked since the original discovery. Several of the others have been subjected to long droughts and hurricane damages. There have also been wartime changes, for some of these hilltops sites have been used in army maneuvers.

In conclusion I would say that *Cetraria islandica* is naturally a species of the open hilltops on Long Island, with beaches near the sea another likely habitat.

ORIENT, LONG ISLAND, N. Y.

Correction: We regret that H. N. Dixon's first name was given incorrectly in the very sincere tribute to him in the December, 1944, issue of THE BRYOLOGIST. The correct name is Hugh.

Vol. 48, Number 2, containing pages 45–92, was issued August 25, 1945.



THE BRYOLOGIST

·JOURNAL OF THE·
SULLIVANT MOSS SOCIETY

AN ILLUSTRATED QUARTERLY
DEVOTED TO NORTH AMERICAN
MOSSES · HEPATICS · LICHENS

VOLUME 48
1945

PUBLISHED QUARTERLY BY THE SULLIVANT MOSS SOCIETY

ERRATA

Page 60, line 28; for *rhabdodonta* read *rhabdodontum*

Page 67, line 19; for **rhabdodonta** read **rhabdodontum**

Page 68, line 9; for *rhabdodonta* read *rhabdodontum*

THE BRYOLOGIST

JOURNAL OF

THE SULLIVANT MOSS SOCIETY

VOL. 48 DECEMBER, 1945 No. 4

THE ATRACHEATA (BRYOPHYTA) OF IOWA*

III. MOSSES AND PERSONS IN IOWA

A SUMMARY OF THE LITERATURE OF MOSSES IN IOWA

HENRY S. CONARD

The manuals that we all must use for the identification of American mosses, which sometimes mention Iowa in stating the range of a species are three:

LESQUEREUX, L., AND THOMAS P. JAMES. Manual of the mosses of North America. 1884. Pp. 1–447. *Pl. I–VI.* (Referred to as L. and J.)

GROUT, A. J. Mosses with hand-lens and microscope. Pp. 1–416, Fig. 1–220, Pl. 1–88. 1903–1910. Part 1, July 1903;[1] 2, May 1904; 3, June 1906; 4, April 1908; 5, July 1910. Published by the author, Newfane, Vt. (Referred to as M. H. M.)

GROUT, A. J. Moss flora of North America, vols. 1–3. 1928–1940. Publ. by the author, Newfane, Vt.
Vol. 1, part 1, Oct. 1936; 2, Aug. 1937; 3, Oct. 1938; 4, July 1939.
Vol. 2, part 1, Nov. 1933; 2, May 1935; 3, Dec. 1935; 4, Sept. 1940.
Vol. 3, part 1, Sept. 1928; 2, June 1931; 3, Nov. 1932; 4, Aug. 1934.
(Referred to as M. F. N. A.)

FRYE, T. C., AND L. CLARK. Hepaticae of North America. Univ. of Wash., Seattle; part 1, Nov., 1937; part 2, July, 1943; part 3, Feb., 1945; part 4, in press.

The special literature on Iowa mosses is not extensive. A summary of the publications to date, with brief notes about the authors, seems pertinent to the foregoing lists of species (parts I and II of this series).

* Published with the aid of a grant from The Graduate College of the State University of Iowa.

[1] Holzinger in THE BRYOLOGIST 6: 104 says June; Grout in a recent letter says July.

1876 PRATT, W. H. b. Sept. 6, 1822, d. Dec. 3, 1893. Founder and first secretary of Davenport Academy of Natural Sciences, 1867; Teacher of penmanship in Davenport public schools; Biography in Proc. Davenport Acad. Nat. Sci. **8**: ix–xxiv.

Report on a geological examination of the section of the bluffs recently exposed by the C. R. I. & P. R. R. Proc. Davenport Acad. Nat. Sci. **1**: 96–99. About 25 feet below the surface a bed of brown peat was exposed, containing *Hypnum aduncum* (*Drepanocladus aduncus*) as determined by C. H. Peck, Albany, N. Y. The cut is near Davenport, Scott County.

1884 BESSEY, CHARLES E. b. May 21, 1845, d. Feb., 1915. Ph.D. 1879, State University of Iowa; Professor of Botany, University of Nebraska, 1884–1915; Biography in Proc. Iowa Acad. Sci. **22**: 11–13. 1915.

Preliminary list of bryophytes of the Ames flora. Bull. Iowa Agr. Coll. (issued by the Dept. of Botany) **1884**: 149–50. "—within a radius of 20 miles of the Iowa Agricultural College." The list of 6 Hepaticae and 33 Musci has not been used in preparing our check-list because (1) no counties are designated and (2) the specimens cannot be found either at Ames or Lincoln. All of the species have been collected recently in the same area, except only *Leucobryum glaucum* (as *L. vulgare*). This species is so unmistakable that Bessey must have had it. Probably it was found at The Ledges in Boone County.

1896 (1897) MACBRIDE, THOMAS H[USTON]. b. July 31, 1848, d. Mch. 27, 1934. Asst. Prof. of Natural History, State University of Iowa 1878; Professor of Botany, State University of Iowa; Biography in Proc. Iowa Acad. Sci. **41**: 33–37. 1934.

A pre-Kansan peat bed. Proc. Iowa Acad. Sci. **4**: 63–66. 1896 (1897). This peat in a railroad cut east of Oelwein contains "*Hypnum fluitans* L." The plant is presumably the one now known as *Drepanocladus fluitans* (Hedw.) Warnst.

1896 SHIMEK, BOHUMIL. b. June 25, 1861, d. Jan. 30, 1937. Ph.D. (Honorary), Charles University, Prague, 1914; Professor of Botany, State University of Iowa, 1920–1937; Biography in Proc. Iowa Acad. Sci. **44**: 31–33. 1937.

The flora of the Sioux Quartzite in Iowa. Proc. Iowa Acad. Sci. **4**: 72–77. 1896 (1897). On p. 73 "*Asterella* [*Reboulia*] *hemisphaerica* Beauv. Not common. Abundant in the eastern part of the state."

1897 FITZPATRICK, THOMAS J. b. Apr. 2, 1868. M.S., State University of Iowa 1895. Assistant Professor and Curator of the

Herbarium, University of Nebraska; Biography in American Men of Science Ed. VI, 1938, p. 461.

a. Notes on the flora of northeastern Iowa. Proc. Iowa Acad. Sci. **5**: 107–133. 1897 (July 5, 1898). Names *Marchantia polymorpha* in Winneshiek, Allamakee and Dubuque Counties. "Wet rocks, frequent." One suspects it was *Conocephalum.*

b. Flora of southern Iowa (with F. L. Fitzpatrick). Proc. Iowa Acad. Sci. **5**: 134–173. 1897 (1898). Lists 11 species of liverworts, all found in Johnson County; one of these also occurs in Decatur County, and one in Emmet County. The present writer has not seen any of the specimens cited in Fitzpatrick's list. Three names are questionable.

1898 SHIMEK, B. See above, 1896. The Iowa liverworts. Proc. Iowa Acad. Sci. **6**: 113–116. 1898 (1899). Twenty-one species are given, with counties in which they occur (mostly Johnson Co.), and an occasional comment such as "common," "not rare." The names are as given in Gray's Manual, Ed. VI. Most of the specimens on which this list is based are preserved, mounted in scrap-books, in the Herbarium of the State University of Iowa.

1898 SAVAGE, THOMAS EDMUND. b. Jan. 8, 1866. Ph.D., Yale University 1909; Professor of Geology, University of Illinois, 1906— Biography in American Men of Science Ed. VI, 1938, p. 1237.

A preliminary list of the mosses of Iowa. Proc. Iowa Acad. Sci. **6**: 154–164. 1898 (1899). Lists 82 species, with counties in which they occur. Most of the specimens on which this list is based are preserved, mounted in scrap-books, in the Herbarium of the State University of Iowa. Savage's list was reprinted by Blagg (1927) and this publication was corrected by Cavanagh (1930).

1903 HOLZINGER, JOHN M. b. May 14, 1853, d. May 3, 1929. M.S., Olivet College, 1888; Professor of Elementary Science and Botany in State Teachers' College, Winona, Minn., 1882–1890, 1893–1922; Distributor of Musci Acrocarpi Boreali-Americani; Biography in American Men of Science Ed. IV, 1927, p. 461.

On some fossil mosses. THE BRYOLOGIST **6**: 93–94. From peat underneath the Kansan drift, 32 ft. below the surface of the ground, near Oelwein were identified *Drepanocladus fluitans brachydictyus, D. revolvens* (det. Best), *Calliergon Richardsoni* (det. Best). From Iowa City, 18 ft. below the surface, under the Kansan drift, came *Drepanocladus fluitans glaciale,* det. Best. The Oelwein material was collected by Macbride from a railroad cut (see 1896, above). The Iowa City material was unearthed in excavating for the High School building.

1903 SHIMEK, B. See above, 1896. The flora of the St. Peter Sandstone in Winneshiek County, Iowa. Bull. Lab. Nat. Hist. State Univ. of Iowa **5** (4): 225. 1903 (1904). On page 225 four mosses and three liverworts are named. With due correction of names, all of these species have been collected recently in that region.

1903 SAVAGE, T. E. See above, 1898. A buried peat bed in Dodge Township, Union County, Iowa. Proc. Iowa Acad. Sci. **11**: 103–109. 1903 (1904). The vegetable layer exposed has a maximum thickness of 6 and ½ feet, and contains "*Hypnum (Camptothecium) nitens*" and "*Hypnum (Harpidium) fluitans*" (now *Drepanocladus fluitans*), both det. Holzinger. Neither species now lives in Iowa.

1905 SAVAGE, T. E. See above, 1898. Geology of Fayette County. Iowa Geol. Surv. **15**: 433–546. 1904 (1905). Names the mosses from the Oelwein section (Aftonian), quoting Macbride 1896 and Holzinger 1903, but adding nothing new.

1905 PAMMEL, LOUIS H. b. Apr. 9, 1862, d. Mch. 23, 1931. Ph.D. Washington University (Shaw School of Botany) 1898; Professor of Botany, Iowa State College of Agriculture and Mechanic Arts, Ames, Iowa, 1889–1931; Biography in Proc. Iowa Acad. Sci. **38**: 55–68. 1931. A comparative study of the vegetation of swamp, clay and sandstone areas in western Wisconsin, southeastern Minnesota, northeastern, central, and southeastern Iowa. Proc. Davenport Acad. of Nat. Sciences **10**: 32–126. Refers to "Hypnums" (*Drepanocladi?*) in bogs of Worth and Cerro Gordo Counties, and *Polytrichum juniperinum* in Boone Co.

1907 GREENE, WESLEY. b. Nov. 8, 1849, d. Mch. 28, 1935. LL.B., State University of Iowa 1875; Secretary Iowa State Horticultural Society; Biography in Proc. Iowa Acad. Sci. **42**: 19. 1935 (1936); Trans. Iowa State Hort. Soc. **70**: 126–127. 1935 (1936); portrait *op. cit.* **71**: 6. 1936 (1937).

Plants of Iowa: a preliminary list of the native and introduced plants of the State, not under cultivation. Pp. 264. Bull. State Hort. Soc. Des Moines, 1907. A compilation of names and habitats of all known plants of Iowa from bacteria to orchids. No new data or names. Liverworts nos. 1409–1429 inclusive; mosses 1430–1505 inclusive.

1908 PAMMEL, L. H. See above, 1905. Flora of northern Iowa peat bogs. Report of the Iowa Geological Survey **19**: 735–777. 1908 (1909). On page 750 *Riccia fluitans* is attributed to Winnebago, Emmet and Hamilton Counties, and "*Hypnum fluitans?* No fruit" to Cerre Gordo, Worth, Winnebago and Emmet Counties. The plant now known from those counties is *Drepanocladus aduncus*.

1912 CONARD, HENRY S[HOEMAKER]. b. Sept. 12, 1874. Ph.D., University of Pennsylvania, 1901, Dissertation: Waterlilies. Professor of Botany, Grinnell College, 1906–1944

Ferns and liverworts of Grinnell and vicinity. Proc. Iowa Acad. Sci. **19**: 105–106. 1912. Names six species of Hepaticae and Anthocerotae.

1915 SHIMEK, B. See above, 1896. The plant geography of the Lake Okoboji region. Bull. State Univ. of Iowa. Bulletins from the Laboratories of Nat. Hist. **7**: 1–90. No. 2. May 1, 1915. New Series No. 95. Names four species of Bryophyta of forests, two of prairie, three of ponds and lakes. P. 25 "the prairie Bryophyta are almost a negligible quantity in this region."

1915 DIEHL, WILLIAM W. b. 1891. Ph.D., Harvard 1932. Bureau of Plant Industry, U. S. D. A. 1926– See Amer. Men of Science, Ed. 7.

The flora of the Ledges Region of Boone County, Iowa. Proc. Iowa Acad. Sci. **22**: 77–104. 1915. Mentions *Polytrichum commune.*

1916 EVANS, ALEXANDER W. b. May 17, 1868. Ph.D., Yale University, 1899. Dissertation: The Hawaiian Hepaticae of the Tribe Jubuloideae. Trans. Conn. Acad. Arts & Sci. **10**: 387–462, 1900. Professor of Botany, Yale University. See Amer. Men of Science Ed. VI, 1938, p. 427, and Ann. Bryol. **11**: 1–5. 1938.

Notes on New England Hepaticae XIII. Rhodora **18**: 74–85, 103–119. *Pl. 120.* Apr. and May 1916. Cites a specimen of *Porella platyphylla* from "Iowa City, Iowa (B. Shimek)." Does not cite any *P. platyphylloidea* from Iowa or Ill. but has it from Minn., Wis. and Mo.

1917 GROUT, A. J. b. March 24, 1867. Ph.D., Columbia University, 1897. Dissertation: A revision of the North American Isotheciaceae and Brachythecia. Mem. Torrey Bot. Club **6**: 131–210. Cf. American Men of Science Ed. VI. 1938, p. 564.

A fossil *Camptothecium.* THE BRYOLOGIST **20**: 9. *Pl. 1. Camptothecium Woldenii* n. sp., brought up from 80 or 90 ft. below the surface of the ground in Emmet Co., in 1911; communicated by Wolden.

1919 WOLDEN, B[ERNT] OLAF. b. Oct. 21, 1886. Rural Mail Carrier, Estherville, Emmet Co., Iowa; Fellow of the Iowa Academy of Science.

The Moss and Lichen Flora of Western Emmet County: An annotated list of the Bryophytes and Lichens of the High Lake and Des

Moines River Region. Proc. Iowa Acad. Sci. **26**: 259–267. 1919. Lists 4 liverworts and 33 mosses.

1921 CAVANAGH, LUCY M. b. June 17, 1871, d. April 13, 1936. Assistant in Botany, State University of Iowa. Biography in Proc. Iowa Acad. Sci. **44**: 23–24. 1937.

Notes on the genus *Catharinea* in Iowa. Proc. Iowa Acad. Sci. **28**: 223–224. 1921. *C. angustata* and *C. undulata* are "of very wide distribution." *C. Macmillani* "should be referred to *C. angustata.* Perhaps it might stand as *C. angustata* var. *Macmillani* (Holz.)." A specimen of *C. angustata* from Lee Co. has "distinct papillae."

1927 BLAGG, BETTY [AMY ELIZABETH] (Mrs. E. H. Anderson). b. July 14, 1905.

Preliminary List of Iowa Mosses. Proc. Iowa Acad. Sci. **34**: 125–132. 1927 (1928). Combines the lists of Savage 1898 and Wolden 1919 with 10 species added by Wolden and 42 of her own collecting. Six of the names are new for Iowa, but three of these are mistaken identifications. The paper includes a key to the families of Iowa mosses, with 18 figures.

1928 PAMMEL, L. H. See above, 1905. Ledges State Park, Ed. 2, pp. 1–40. Publ. by the author, Ames, Iowa. Quotes report of *Polytrichum commune* by Diehl, and mentions "juniper moss," presumably *P. juniperinum.*

1928 BLAGG, B. See above, 1927. a. In Grannis Hollow. THE BRYOLOGIST **31**: 98–100. Sept. Reports a day of collecting in Fayette Co., with names of 12 species not previously recorded for Iowa.

b. Additional Notes on Iowa Mosses. Proc. Iowa Acad. Sci. **35**: 113–116. 1928 (1929). Reports 30 species not previously recorded for Iowa, collected by Blagg, Conard, and Wolden. Several corrections have been made in this list.

1929 CAVANAGH, L. M. See above, 1921. a. Notes on Iowa mosses. I. Proc. Iowa Acad. Sci. **36**: 133–135. Reports 16 species not previously recorded for Iowa, with counties; extension of range of *Pogonatum pensilvanicum* (as *P. brevicaule*) and fruiting specimens of *Rhodobryum roseum* and *Climacium americanum* from Muscatine Co.

b. Mosses new to Iowa. THE BRYOLOGIST **32**: 112–113. Nov. 1929. Repeats the list of 1929a, above, and adds 15 more species, with counties. This publication was regarded by Miss Cavanagh, on the advice of Professor Shimek, as Notes on Iowa Mosses III, though that fact does not occur anywhere in print.

1929 BLAGG, B. See above, 1927. Additional Notes on Iowa mosses. Proc. Iowa Acad. Sci. **36**: 137–139. Lists 18 species not previously recorded for Iowa, collected by Blagg, Conard, and Wolden.

1930 GROUT, ABEL JOEL. See above, 1917. A fossil form of *Drepanocladus fluitans Jeanbernati* (Ren.) Grout. THE BRYOLOGIST **33**: 33. The specimen was from 15 ft. below the surface of the ground near Mud Lake, Emmet Co., Iowa, sent in by Wolden.

1930 BLAGG, B. See above, 1927. Additional notes on Iowa mosses—1929–1930. Proc. Iowa Acad. Sci. **37**: 96–98. 1930 (1931). Names 28 species of mosses and liverworts not previously recorded for Iowa, collected by Blagg, Conard, and Wolden.

1930 CAVANAGH, L. M. See above, 1921. Notes on Iowa mosses —II. Proc. Iowa Acad. Sci. **37**: 98–100. 1930 (1931). Reprints the list by Bessey 1884, with names brought into accord with Grout: Mosses with Hand Lens and Microscope. Makes several corrections in Blagg's reprint of Savage, 1898.

1931 CAVANAGH, L. M. See above, 1921. Notes on Iowa mosses. IV. Proc. Iowa Acad. Sci. **38**: 129–132. Adds 13 species not previously recorded for Iowa. For Notes on Iowa Mosses III, see Cavanagh, 1929.

1932 CONARD, HENRY S. See above, 1912. a. Mosses of Pine Hollow, Iowa. THE BRYOLOGIST **35**: 28–30. March 1932. A day's collecting in Dubuque County yielded 98 species of bryophytes, of which 14 were not previously recorded for Iowa.

1932 CONARD, H. S. AND B. O. WOLDEN. See above, 1912, 1919. A Key to the mosses of the Okoboji Region. University of Iowa Studies. New Series No. 238. Nov. 1, 1932. Studies in Natural History. Vol. XIV, No. 7. Pp. 1–27, *Pl. 1, 2*. Gives 134 species of Musci and 16 of Hepaticae and Anthocerotae. The "Region" includes a part of Minnesota. The text does not indicate which species are in Iowa, except that those collected by Wolden in Emmet Co. (100 mosses and 14 liverworts) are marked with an asterisk.

1932 CAVANAGH, L. M. See above, 1921. Notes on Iowa mosses. V. Proc. Iowa Acad. Sci. **39**: 53–55. 1932 (1933). Reports 12 species not previously recorded for Iowa; three of these names (one of them wrong) contributed by Conard.

1932 CONARD, HENRY S. See above, 1912. A boreal moss community. Proc. Iowa Acad. Sci. **39**: 57–61. 1932 (1934). The bryophytes of Pine Hollow, Dubuque Co., claiming 13 species that were known only from that locality.

1934 SAYRE, GENEVA. b. June 12, 1911. Ph.D., University of Colorado, 1938. Dissertation: Mosses of Colorado.

The Grimmias of Iowa. THE BRYOLOGIST **37**: 29–34. March–April, 1934. Seven species and 2 varieties with key for identifying

them, and counties from which each is known. Each species is critically described.

1934 CAVANAGH, L. M. See above, 1921. Notes on Iowa mosses —VI. Proc. Iowa Acad. Sci. **41**: 97–102. 1934 (1935). Describes *Fabronia iowensis* n. sp., without Latin diagnosis. See Part 2 of this series. Adds 10 species for the Okoboji Region, mostly without county references, and 19 species and varieties supposedly not previously recorded for Iowa, with counties, communicated by Conard.

1934 SAYRE, GENEVA, AND HENRY S. CONARD. See above, 1934, 1912. The mosses of southwestern Iowa. Proc. Iowa Acad. Sci. **41**: 105–106. 1934 (1935). Names 8 species not given in Conard & Wolden 1932.

1937 PARIS, C. D. b. Aug. 10, 1911. M.S. Iowa State College 1939.

Funaria flavicans Michx. in Iowa. Proc. Iowa Acad. Sci. **44**: 103. 1937. He found this species in abundance at State Fish Hatchery, Manchester. Delaware Co.

1938 CONARD, HENRY S. See above, 1912. a. One hundred Iowa mosses. Proc. Iowa Acad. Sci. **45**: 63–68. 1938 (1939). Lists the ten herbaria receiving sets, and the 100 species and varieties distributed gratuitously. Counties are given for many of these. The ten packets of any one species were usually not from one and the same collection.

b. The fir forests of Iowa. Proc. Iowa Acad. Sci. **45**: 69–72. 1938 (1939). Locates 6 spots where *Abies balsamea* grows (or grew) with the boreal mosses of each locality. Other counties are given for some of the species.

1940 CONARD, HENRY S. See above, 1912. a. Liverworts of the so-called Unglaciated Area of Iowa. Proc. Iowa Acad. Sci. **47**: 91–95. 1940 (1941). Lists 12 species from Giard School, Clayton Co., 7 from Pictured Rocks, McGregor, Clayton Co., and 5 from other localities.

b. Thirty Iowa liverworts. Proc. Iowa Acad. Sci. **47**: 97–99. 1940 (1941). Lists the ten herbaria receiving sets, and the 30 species distributed gratuitously, with counties.

1940 O'HARRA, ROBERTA (MRS. ROBERT H. POTTS, JR.). b. July 2, 1920. M.A., Tulane University 1944. *Aphanorhegma patens* in Iowa. Proc. Iowa Acad. Sci. **47**: 115–122. *Fig. 1–22.* 1940 (1941).

1941 STEERE, WILLIAM C[AMPBELL]. b. Nov. 4, 1907. Ph.D., University of Michigan, 1932, Dissertation: Chromosome behavior in triploid Petunia hybrids. Am. Journ. Bot. 1932; Assistant Professor of Botany, University of Michigan, 1936; Associate Professor 1942–. See American Men of Science Ed. VI, 1938, p. 1352.

Pleistocene mosses from the Aftonian interglacial deposits in Iowa. Papers of the Mich. Acad. of Science, Arts and Letters **27**: 75–104. 1941 (1942). Reviews literature of pleistocene mosses (Iowa, p. 76). Reports, in material from the Aftonian near Afton, Union Co., Iowa, 32 species. Of these the following are not now found in Iowa: *Sphagnum squarrosum, Dicranum Bergeri, Calliergon stramineum, C. cordifolium, C. Richardsoni, C. giganteum, C. trifarium, C. turgescens, Drepanocladus fluitans, D. exannulatus, Scorpidium scorpioides, Camptothecium nitens, C. Woldenii, Polytrichum strictum.* New species are described as *Calliergon aftonianum, C. Hansenae, C. Kayianum, Drepanocladus apiculatus.* Of contemporary species still found in Iowa the Union Co. beds yielded *Sphagnum capillaceum, S. cymbifolium* (both sens. lat.), *Fissidens* sp., *Philonotis* sp., *Fontinalis* spp., *Anomodon attenuatus, Thuidium delicatulum, Drepanocladus aduncus, Amblystegium Juratzkanum, Leptodictyum riparium, Campylium stellatum,* and *Hylocomium splendens.*

1942 CONARD, HENRY S. See above, 1912. The liverworts of Iowa. Proc. Iowa Acad. Sci. **49**: 191–195. 1942. Lists 54 species, with all known counties. Explains omission of 8 names previously published.

1942 DREXLER, ROBERT V. b. Sept. 19, 1910. Ph.D., University of Illinois, 1940. Dissertation: Community and Geographic Relations of the Bryophytes of southwestern Ontario [North of Minnesota]; Assistant Professor in Biology, Coe College, Cedar Rapids, Linn Co., Iowa.

A preliminary list of bryophytes of Linn County, Iowa. Proc. Iowa Acad. Sci. **49**: 197–204. 1942. Names 96 species and varieties of mosses, and 18 of liverworts for the County. Many of these were not seen by the author, but were quoted from Cavanagh, Conard and Savage. Credit is given for these sources.

1943 HAYDEN, ADA. b. Aug. 14, 1884. Ph.D., Iowa State College, 1918. Dissertation: The ecologic anatomy of some plants of a prairie province in Central Iowa; Assistant professor of Botany, Iowa State College 1918–; Biography in Amer. Men of Sci. Ed. VI, 1938, p. 618.

A botanical survey in the Iowa Lake Region of Clay and Palo Alto Counties. Iowa State College Journal of Science **17**: 277–416. Apr. 1943. The Moss Flora, p. 334–336, describes the habitats, social relations and conservational values of mosses. The Annotated List of Plants gives on pages 352–356 the species of liverworts (11) and mosses (42) with family, common name, locality and habitat. This is the most complete account of mosses in a limited area known to the present writer. No keys to or descriptions of species are given.

1943 CONARD, HENRY S. See above, 1912. a. Check list of the Atracheata (Bryophyta) of Iowa. Printed for the author, Dec. 1943. 16 pp. Lists 255 species, varieties and forms of mosses and 59 of liverworts. See Conard 1945a.

b. Thirty-five Iowa mosses. Proc. Iowa Acad. Sci. **50**: 181–183. 1943 (1944). Names ten herbaria to which collections were sent, and names the mosses, with counties. Supplement to Conard 1938a.

1943 DREXLER, ROBERT V. See above, 1942. Additions and notes to the bryophyte flora of Linn County, Iowa. Proc. Iowa Acad. Sci. **50**: 195–197. 1943 (1944). Adds 11 mosses and 7 liverworts to the list of Drexler 1942.

1944 WYNNE, FRANCES E. b. July 25, 1916. Ph.D., University of Michigan, 1942. Dissertation: A revision of the North American Species of *Drepanocladus*.

a. Studies in *Drepanocladus*. II. Phytogeography. Amer. Midland Naturalist **32**: 643–668. Nov. 1944 (1945). Cites all reports of fossil *Drepanocladi* from Iowa.

b. Studies in *Drepanocladus*. IV. Taxonomy. THE BRYOLOGIST **47**: 147–189, pl. 1–10. December 1944. Attributed to Iowa, without citation of counties or localities are *D. aduncus typicus*, *D. a. Kneiffii*, *D. uncinatus* var. *typicus* Wynne, var. nov. and *D. revolvens* (including *D. intermedius*). *D. aduncus polycarpus* is not mentioned in either of the above papers, but "short celled phases" of the three accepted varieties are illustrated.

1945 CONARD, HENRY S. See above, 1912. a. Additions and emendations for the Check List of the Atracheata (Bryophyta) of Iowa. Leaflet privately printed (300 copies), Feb. 1945. Lists 25 species not previously included (Conard 1943a) and deletes 5 species.

b. The Atracheata (Bryophyta) of Iowa. 1. The species and their geographic distribution in the State. THE BRYOLOGIST, **48**: 70–82. June 1945. 2. Iowa mosses in print. *Ibid.* Sept. 1945. 3. Mosses and persons in Iowa. *Ibid.*

MILLS, WIER R. b. Sept. 28, 1878. Educ. Pierson High School; Morningside College School of Music. Merchant, general merchandise, Pierson, Woodbury County, Iowa. Musician, naturalist and astute collector, who has sent in the only known specimens of *Acaulon Schimperianum* and *Pohlia atropurpurea* from Iowa, and the second collection of *Physcomitrium Hookeri* × *Funaria hygrometrica*.

SAVAGE, DAVID, S. Farmer, Mt. Pleasant, Iowa. Brother of T. E. Savage (see above, 1898). Collector of books and plants; discoverer of *Dicranum rugosum* in Iowa, 1944.

GRINNELL COLLEGE AND STATE UNIVERSITY OF IOWA.

THE LICHEN AND BRYOPHYTE FLORA FROM JAMES BAY UP TO LAKE MISTASSINI

ERNEST LEPAGE, PTRE.

In the summer of 1943, the author accompanied Father Arthème Dutilly, O. M. I.,[1] on an exploration of the Rupert River, from James Bay up to Lake Mistassini. This journey of about 400 miles was made by canoe across a region of sandy pine forest and peat-bog with black spruce. Very different is the area of Lake Mistassini with its dolomitic limestone cliffs, especially on the central islands.

A list of the stations at which the specimens were collected follows:

ONTARIO: Moosonee, James Bay, July 15–19, 1943.
QUEBEC: Rupert House, James Bay, July 20–21, 1943.
House Portage up to 6 miles from Rupert House, July 21, 1943.
Smoky Hills and Plum Pudding Portages, Rupert River, July 22, about Lat. 51° 25′ N., Long. 78° 35′ W.
Between Plum Pudding and Chigaskatagan Portages, July 23, about Lat. 51° 25′ N., Long. 78° 15′ W.
Chigaskatagan and Four Portages, July 24, about Lat. 51° 25′ N. Long. 77° 45′ W.
Oatmeal Portage, July 25, about Lat. 51° 25′ N., Long. 77° 30′ W.
From Oatmeal Portage to Lake Nemaska, July 26, about Lat. 51° 25′ N., Long. 77° 10′ W.
Lake Nemaska, July 27–28, about Lat. 51° 20′ N., Long. 76° 50′ W.
From Lake Nemaska to first Portage, July 29–30, about Lat. 51° 20′ N., Long. 76° 30′ W.
Marten River, about 25 miles from Lake Nemaska, July 31, about Lat. 51° 15′ N., Long. 76° 20′ W.
Lake Cooper and Northern Tesekau Lake, August 1, about Lat. 51° 10′ N., Long. 76° W.
Weakwaten, La Cache and Robert Lakes, August 2, about Lat. 51° 7′ N., Long. 75° 45′ W.
Lake Camousitchouan, August 4, about Lat. 51° 7′ N., Long. 75° 25′ W.
Vicinity of Sand and Kokomenhani Lakes, August 5, about Lat. 51° 10′ N., Long. 74° 40′ W.
Between Miskittenau and Mistassini Lakes, August 7, about Lat. 51° 5′ N., Long. 74° W.
Lake Mistassini, August 10–17, about Lat. 50° 30′–51° N., Long. 73° 30′–74° W.

I am greatly indebted to Dr. Albert W. C. Herre, Dr. E. C. Berry, Dr. A. W. Evans, Dr. Richard T. Wareham, Dr. Lois Clark, Dr.

[1] Director of the Arctic Institute, The Catholic University of America, Washington D. C.

Margaret Fulford, Dr. LeRoy Andrews, Dr. Seville Flowers, Dr. Winona Welch, Dr. A. J. Grout, Dr. Frances E. Wynne and Dr. W. C. Steere for the determination of specimens. The mosses were determined by Dr. Wareham, lichens by Dr. Herre, Cladonieae and Hepaticae by Dr. Evans, except as otherwise indicated.

The nomenclature of the lichens is according to the "Catalogus Lichenum Universalis" (Zahlbruckner, 1921–1932). For the Cladonieae, I follow the numerous papers of Dr. Evans; for the Hepaticae, "List of Hepaticae found in the United States, Canada, and Arctic America" (Evans, 1940); for the mosses, "List of Mosses of North America North of Mexico (Grout, 1940).

The asterisk (*) points out the entities apparently new to Québec.

LICHENS

ALECTORIA JUBATA (L.) Ach. On tree trunks; Moosonee, July 17, *Nos. 4426, 4414;* Rupert House, July 20, *Nos. 4560, 4561;* Chigaskatagan Portage, July 23, *No. 4478;* Lake Nemaska, July 28, *No. 4489;* on Laurentian gneisses, near Lake Tesekau, August 1, *No. 4444.* This species is ubiquitous on the coniferous trees in the Hudsonian forest.

BAEOMYCES ROSEUS Pers. On sandy soil; Chigaskatagan Portage, July 23, *No. 4480;* near Lake Tesekau, August 1, *No. 4388.*

BAEOMYCES RUFUS (Huds.) Rabent. On peat; Moosonee, July 17, *No. 4412;* on Laurentian gneisses, near Lake Mistassini, August 9, *No. 4355.*

BUELLIA DISCIFORMIS (E. Fries) Mudd. On trunk of canoe birch; Lake Nemaska, July 28, *No. 4494.*

CETRARIA PINASTRI (Scop.) Roehl. On rotten wood, Plum Pudding Portage, July 22, *No. 4577;* on jack pine, near Lake Tesekau, August 1, *No. 4386.*

CALOPLACA CERINA (Ehrh.) T. Fries. On bark of poplar, Plum Pudding Portage, July 22, *No. 4586.*

CALOPLACA FERRUGINEA (Huds.) T. Fries. On mosses; Lake Mistassini, central islands, August 12, *No. 4276.*

CLADONIA ALPESTRIS (L.) Rabenth. On granitic rocks, Plum Pudding Portage, July 22, *No. 4574;* on granitic sand under the pines, Lake Nemaska, July 28, *No. 4493;* on dolomitic cliffs, Lake Mistassini, central islands, August 10, *No. 4253.*

CLADONIA ALPESTRIS f. ABERRANS des Abbayes. On granitic sand under pines; Lake Nemaska, July 28, *No. 4490.* Dr. Evans (Rhodora **45**: 419, 1943) notes: "According to our present knowledge f. *aberrans* is the dominant form of C. *alpestris* in Japan. It occurs also as a rarity in North America but is unknown in Europe." The other localities in Québec are: Tadoussac (Evans, 1937), Sacré-Coeur,

Rimouski Co. (Lepage, 1943) and Mt. Richardson, Gaspé Co. (Torrey, 1937).

CLADONIA AMAUROCRAEA (Floerke) Schaer. On Laurentian gneiss, near Lake Tesekau, August 1, *No. 4446.*

CLADONIA AMAUROCRAEA f. CELOTEA (Ach.) Wainio. On Laurentian gneisses, below the Four Portages, July 25, *Nos. 4528, 4529;* on granitic rocks, upwards Lake Nemaska, July 30, *No. 4497;* Lake Mistassini, central islands, August 10, *No. 4331.*

CLADONIA AMAUROCRAEA f. OXYCLADA Wainio. On wet dolomitic rocks, Lake Mistassini, central islands, August 12, *No. 4255.*

CLADONIA AMAUROCRAEA f. TENUISECTA Wainio. On granitic rocks, below Lake Nemaska, July 25, *Nos. 4565, 4566;* Oatmeal Portage, July 26, *No. 4615;* on granitic sand under pines, near Lake Mistassini, August 9, *No. 4267.*

CLADONIA BELLIDIFLORA (Ach.) Schaer., f. SUBULIFORMIS (Wallr.) Wainio. Peat-bog, along Oatmeal Portage, July 25, *No. 4460.*

CLADONIA CENOTEA (Ach.) Schaer., f. CROSSOTA (Ach.) Nyl. Peat-bog, upwards Lake Nemaska, July 30, *Nos. 4317, 4497a.*

*CLADONIA COCCIFERA (L.) Willd. Lake Mistassini, central islands, August 12, *No. 4378.* It is the first sure record to Québec.

CLADONIA CORNUTA (L.) Schaer., f. CYLINDRICA Schaer. On dry earth, along the Chigaskatagan Portage, July 23, *No. 4481;* peat-bog below Lake Nemaska, July 27, *No. 4603a;* under pines, above Lake Nemaska, July 30, *No. 4543.*

CLADONIA CORNUTA f. SCYPHOSA Schaer. On Laurentian gneiss, along the Plum Pudding Portage, July 22, *No. 4569;* peat-bog, below Lake Nemaska, July 26, *No. 4602.*

CLADONIA CRISPATA (Ach.) Flot., var. INFUNDIBULIFERA (Schaer.) Wainio. Peat-bog, Oatmeal Portage, July 26, *No. 4601;* under pines, Marten River, near Lake Tesekau, August 1, *No. 4384;* peat-bog, below Lake Mistassini, August 7, *No. 4338.*

CLADONIA CRISPATA var. VIRGATA (Ach.) Wainio. Along the Chigaskatagan Portage, July 23, *No. 4483;* peat-bog, below Lake Nemaska, July 26, *No. 4604;* under pines, Lake Nemaska, July 28, *No. 4492;* on Laurentian gneiss, above Lake Nemaska, July 30, *No. 4537;* on gneisses, near Lake Tesekau, August 2, *No. 4372.*

CLADONIA CRISPATA var. VIRGATA f. KAIROMOI Wainio. On Laurentian gneiss, upwards Lake Nemaska, July 30, *No. 4541.*

CLADONIA DEFORMIS (L.) Hoffm. Along the Plum Pudding Portage, July 22, *No. 4571;* on Laurentian gneiss, Marten River, near Lake Tesekau, August 2, *No. 4369.*

CLADONIA DEGENERANS (Floerke) Spreng., f. DILACERATA Schaer. Under the pines, Marten River, near Lake Tesekau, August 1, *No. 4449.* This form is known in Québec only from one other locality: St. Félicien, Lake St-John (Bro. Anselme).

*CLADONIA DEGENERANS f. EUPHOREA (Ach.) Floerke. On Laurentian gneiss, above Lake Nemaska, July 30, *No. 4540.*

CLADONIA DEGENERANS f. PHYLLOPHORA (Ehrh.) Flot. Peat-bog, upwards Lake Nemaska, July 30, *No. 4326*.

CLADONIA FURCATA (Huds.) Schrad., var. PINNATA (Floerke) Wainio f. FOLIOLOSA (Del.) Wainio. On Laurentian gneiss, near Lake Tesekau, August 2, *No. 4382*.

CLADONIA GONECHA (Ach.) Asahina. Peat-bog, below Lake Nemaska, July 26, *No. 4603*.

CLADONIA GRACILIS (L.) Willd., var. CHORDALIS (Floerke) Schaer. On Laurentian gneiss, near Lake Tesekau, August 2, *No. 4452*.

CLADONIA GRACILIS var. DILATATA (Hoffm.) Wainio. Along the Chigaskatagan Portage, July 23, *No. 4482*.

CLADONIA GRACILIS var. DILATATA f. ANTHOCEPHALA (Floerke) Wainio. Peat-bog, above Lake Nemaska, July 29, *No. 4495*.

CLADONIA LEPIDOTA Nyl. On Laurentian gneisses: Oatmeal Portage, July 26, *No. 4473;* near Lake Tesekau, August 2, *Nos. 4370, 4456*. In Québec, collected only at Mt. Albert, Gaspé Co. (R. H. Torrey, Legage).

CLADONIA MITIS Sandst. On granitic sand, Lake Nemaska, July 28, *No. 4491;* on Laurentian gneiss, above Lake Nemaska, July 30, *Nos. 4539, 4544;* on chalcite, Lake Robert, August 3, *No. 4375*.

CLADONIA MULTIFORMIS Merrill, f. FINKII (Wain.) Evans. On Laurentian gneiss, near Lake Tesekau, August 2, *No. 4457*.

CLADONIA MULTIFORMIS f. SUBASCYPHA (Wain.) Evans. On Laurentian gneiss, near Lake Tesekau, August 2, *No. 4453*.

CLADONIA PLEUROTA (Floerke) Schaer. On granitic rocks, above Lake Nemaska, July 30, *Nos. 4461, 4462*.

*CLADONIA PLEUROTA f. EXTENSA (Ach.) Floerke. On granitic rocks, along the Plum Pudding Portage, July 22, *No. 4572*.

CLADONIA PYXIDATA (L.) Hoffm. var. NEGLECTA (Floerke) Mass., f. LOPHYRA (Ach.) Koerb. On Laurentian gneiss, about Lake Tesekau, August 2, *Nos. 4381, 4455*.

CLADONIA PYXIDATA var. POCILLUM (Ach.) Flot. On dolomitic cliffs, Lake Mistassini, central islands, August 10, *No. 4247*, August 12, *No. 4292*.

CLADONIA SCABRIUSCULA (Del.) Leight., f. ELEGANS Robbins. On rocks, between Plum Pudding and Chigaskatagan Portages, July 23, *No. 4506*.

CLADONIA SYLVATICA (L.) Hoffm. Peat-bog, Moosonee, James Bay, July 17, *No. 4396*.

CLADONIA TURGIDA (Ehrh.) Hoffm., f. SCYPHIFERA Wainio. Under the pines, above Lake Nemaska, July 30, *Nos. 4485, 4538*.

CLADONIA UNCIALIS (L.) Web. On mossy gneisses, about Lake Kokomehani, August 6, *No. 4245*.

CLADONIA VERTICILLATA (Hoffm.) Schaer., f. AGGREGATA (Del.) Oliv. On Laurentian gneiss, about Lake Tesekau, August 2, *Nos. 4371, 4454*.

CLADONIA VERTICILLATA f. EVOLUTA (T. Fries) Stein. Under piens, above Lake Nemaska, July 30, *No. 4542;* on granitic sand under pines, Marten River, August 1, *No. 4389;* on granitic rocks, Lake Tesekau, August 2, *Nos. 4453, 4454.*

COLLEMA CRISPUM (L.) Wigg. On clayey slope, Rupert House, James Bay, July 20, *No. 4511.*

*COLLEMA NYLANDERIANUM A. Zahlbr. On dolomitic cliff, Lake Mistassini, central islands, August 12, *No. 4296.*

GYROPHORA MUHLENBERGII Ach. On Laurentian gneiss, Plum Pudding Portage, July 22, *No. 4568;* along Four Portages, July 25, *No. 4530.*

LECANORA HAGENI Ach. On poplar, along Plum Pudding Portage, July 22, *No. 4587.*

LECANORA POLYTROPA (Ehrh.) Rabh. On Laurentian gneiss, Plum Pudding Portage, July 22, *No. 4576.*

LECIDEA CONTIGUA E. Fries. On gneiss, about Lake Kokomenhani, August 6, *No. 4286.*

LECIDEA CYANEA (Ach.) Roehl. On gneiss boulder, above Lake Robert, August 3, *No. 4363.*

LECIDEA GRANULOSA (Hoffm.) Ach. On spruce, along Chigaskatagan Portage, July 23, *No. 4479;* on peat, below Lake Nemaska, July 26, *No. 4600;* peat-bog, above Lake Sand, August 5, *No. 4351.*

*LECIDEA LIMOSA Ach. Over mosses on dolomitic rocks, Lake Mistassini, central islands, August 12, *No. 4241.* Elsewhere in North America: Winter Harbour, Lat. 66° 8′ N. (*Dutilly, No. 6941*); reported by J. L. Lowe (Lloydia **2**: 225–304, 1939) from the Aridondack Mountains; reported also by Zahlbruckner from New Hampshire. The collection from Colorado (Fink's "Lichen Flora," p. 208) is *Lecidea Berengeriana* according to J. L. Lowe (*loc. cit.*).

LECIDEA MACROCARPA (Lam. & DC.) Steud. On Laurentian gneiss, about Lake Tesekau, August 1, *No. 4393.*

LECIDEA ULIGINOSA (Schrad.) Ach. Peat-bog, Moosonee, James Bay, July 17, *No. 4432.*

LECIDEA WALLROTHI (Floerke) A. Zahlbr. Under pines, about Lake Tesekau, August 1, *No. 4392.*

LEPTOGIUM LICHENOIDES (L.) Zahlbr. On clayey slope, Rupert House, James Bay, July 20, *No. 4510.*

NEPHROMA LAEVIGATUM Ach. On mossy rocks, along Plum Pudding Portage, July 22, *No. 4578.*

NEPHROMOPSIS CILIARIS (Ach.) Hue. On black spruce, Moosonee, James Bay, July 17, *Nos. 4415, 4426a;* on jack pine, about Lake Tesekau, August 1, *No. 4394.*

PARMELIA CENTRIFUGA (L.) Ach. On jack pine, about Lake Tesekau, August 1, *No. 4385* (det. Dr. E. C. Berry).

PARMELIA CONSPERSA (Ehrh.) Ach. On Laurentian gneiss, upwards Lake Nemaska, July 30, *No. 4488,* (det. Berry).

*PARMELIA EXASPERATA (Ach.) DeNot. On granitic rock, about Lake Tesekau, August 1, *No. 4391* (det. Berry). Probably new to

Canada. The distribution of this species according to Dr. Berry[1] is: "Maine to West Virginia, west to California."

PARMELIA OLIVACEA Nyl. On Laurentian gneiss, above Lake Nemaska, July 30, *No. 4536* (det. Berry).

PARMELIA OMPHALODES (L.) Ach. Lake Mistassini, central islands, August 12, *No. 4292*.

PARMELIA PHYSODES (L.) Ach. On spruce, Moosonee, James Bay, July 17, *Nos. 4416, 4425* (det. Berry); along Chigaskatagan Portage, July 23, *No. 4484* (det. Berry); spruce trees, Lake Mistassini, June, 1885 (J. M. Macoun; reported as *P. physodes* var. *vulgaris* Koerb.).

PARMELIA PHYSODES var. cf. LABROSA (L.) Ach. On tree, Lake Nemaska, July 27, *No. 4594* (det. Berry).

PARMELIOPSIS AMBIGUA (Wulf.) Nyl. On spruce, Moosonee, James Bay, July 17, *No. 4413*.

*PARMELIOPSIS DIFFUSA (Web.) Riddle. On jack pine, about Lake Tesekau, August 1, *No. 4387*.

PELTIGERA CANINA (L.) Willd., f. SPONGIOSA Tuck. Peat-bog, Moosonee, James Bay, July 17, *No. 4424*.

PELTIGERA MALACEA (Ach.) Funck. Under pines, about Lake Tesekau, August 1, *No. 4383*.

PELTIGERA RUFESCENS (Weis.) Humb. Peat-bog, Moosonee, James Bay, July 17, *No. 4429*.

PHYSCIA AIPOLIA (Ach.) Nyl. On poplar, along Plum Pudding Portage, July 22, *No. 4585*.

PHYSCIA STELLARIS (L.) Nyl. On poplar, Lake Mistassini, August 10, *No. 4253*.

RAMALINA CALICARIS (L.) Roehl. On trees, along Plum Pudding Portage, July 22, *No. 4581*.

RHIZOCARPON CONCENTRICUM (Dav.) Beltr. On Laurentian gneiss, along Plum Pudding Portage, July 22, *No. 4588*.

RHIZOCARPON GRANDE (Floerke) Arn. On Laurentian gneiss, Plum Pudding Portage, July 22, *No. 4588*. The identity is not certain on account of sterile state of this specimen.

STEREOCAULON CONDENSATUM Hoffm. On granitic sand: above Lake Nemaska, July 30, *No. 4468;* below Lake Tesekau, August 1, *No. 4390;* above Lake Sand, August 5, *No. 4350*.

STEREOCAULON PASCHALE (L.) Hoffm. On granitic sand and rocks: Plum Pudding Portage, July 22, *No. 4567;* above Lake Nemaska, July 30, *No. 4535;* about Lake Tesekau, August 1, *No. 4448;* above Lake Sand, August 5, *No. 4258*.

STEREOCAULON PASCHALE var. CONGLOMERATUM E. Fries. On Laurentian gneisses: between Plum Pudding and Chigaskatagan Portages, July 23, *No. 4503;* above Four Portages, July 25, *No. 4531;* above Lake Nemaska, July 30, *No. 4325*.

USNEA DASYPOGA (Ach.) Roehl. On trees, along Chigaskatagan Portage, July 23, *No. 4504*.

[1] A Monograph of the Genus Parmelia in North America, North of Mexico, Ann. Mo. Bot. Gard. 28: 66. 1941.

USNEA DASYPOGA var. PLICATA (Hoffm.) Hue. On spruce, Chigaskatagan Portage, July 23, *No. 4478;* Lake Nemaska, July 28, *No. 4589.*

USNEA TRICHODEA Ach. On spruce: Rupert House, James Bay, July 20, *No. 4561;* Lake Mistassini, central islands, August 15, *No. 4290.*

XANTHORIA CANDELARIA (L.) Kickx. On poplar, Plum Pudding Portage, July 22, *No. 4584.*

HEPATICAE

PTILIDIACEAE

BLEPHAROSTOMA TRICHOPHYLLUM (L.) Dumort. On wet dolomitic rocks: Lake Mistassini, central islands, August 10, *No. 4268* (det. Evans), August 12, *No. 4281* (det. Fulford).

PTILIDIUM CILIARE (L.) Nees. On Laurentian gneiss, Oatmeal Portage, July 26, *No. 4476;* peat-bog, above Lake Nemaska, July 30, *No. 4316.*

PTILIDIUM PULCHERRIMUM (Web.) Hampe. On trees, Plum Pudding Portage, July 22, *Nos. 4582, 4591;* on Laurentian gneiss, Four Portages, July 25, *No. 4532;* on rotten wood, Peat Island, below Lake Nemaska, July 26, *No. 4610.*

LEPIDOZIACEAE

BAZZANIA TRICRENATA (Wahl.) Trevis. On dolomitic wall, Lake Mistassini, central islands, August 15, *No. 4342.*

LEPIDOZIA REPTANS (L.) Dumort. On rotten wood, Lake Mistassini, central islands, August 13, *No. 4264.*

CALYPOGEIACEAE

CALYPOGEIA TRICHOMANIS (L.) Corda. Peat-bog, Moosonee, James Bay, July 17, *No. 4439;* on sandy path, above Lake Robert, August 3, *No. 4361.*

CEPHALOZIACEAE

CEPHALOZIA BICUSPIDATA (L.) Dumort. On dry peat, above Lake Nemaska, July 30, *No. 4320.*

CEPHALOZIA MEDIA Lindb. On rotten stump, Moosonee, James Bay, July 16, *Nos. 4409, 4437, 4440.*

*CLADOPODIELLA FRANCISCI (Hook.) Buch. On peaty soil, above Lake Nemaska, July 30, *Nos. 4320, 4324, 4465.* Range previously known: Nova Scotia, Maine, New Hampshire, Massachusetts, Rhode Island and New York (Long Island and Fisher's Island) (according to Dr. Evans, *in litt.*).

ODONTOSCHISMA DENUDATUM (Mart.) Dumort. Peat-bog, Marten River, about Lake Kokomenhani, August 6, *No. 4343.*

ODONTOSCHISMA MACOUNII (Aust.) Underw. On moist dolomitic rocks, Lake Mistassini, central islands, August 12, *No. 4237* (det. Fulford), August 15, *No. 4261* (det. Fulford).

HARPANTHACEAE

MYLIA ANOMALA (Hook.) S. F. Gray. Dry peat-bog, above Lake Sand, Marten River, August 5, *Nos. 4335, 4349.*

MYLIA TAYLORI (Hook.) S. F. Gray. Dry peat-bog, above Lake Nemaska, July 30, *No. 4467.*

JUNGERMANNIACEAE

ANASTROPHYLLUM MICHAUXII (Web.) Buch. On peat soil, above Lake Nemaska, July 30, *No. 4322.*

GYMNOCOLEA INFLATA (Huds.) Dumort. On Laurentian gneiss, Oatmeal Portage, July 26, *Nos. 4471, 4474, 4614;* on peat soil, above Lake Nemaska, July 30, *No. 4321;* on wet path, Marten River, below Lake Tesekau, August 1, *No. 4450;* on Laurentian gneiss, Lake Tesekau, August 2, *No. 4373;* on peat soil, Lake Camousitchouan, August 5, *No. 4358a.*

ISOPACHES BICRENATUS (Schmid.) Buch. Under pines on wet path, about Lake Tesekau, August 1, *No. 4360.*

JAMESONIELLA AUTUMNALIS (DC.) Steph. Under pines on wet path, about Lake Tesekau, August 1, *No. 4451,* (det. Evans; sterile, not sure); on dolomitic rocks, Lake Mistassini, central islands, August 14, *No. 4261* (det. Fulford).

JUNGERMANNIA PUMILA With. Under pines, above Lake Nemaska, July 30, *No. 4487a.*

LOPHOZIA ALPESTRIS (Schleich.) Evans. On peat soil, above Lake Nemaska, July 30, *No. 4319 in part.;* on moist dolomitic rocks, Lake Mistassini, central islands, August 12, *Nos. 4277, 4280.*

LOPHOZIA INCISA (Schrad.) Dumort. On rotten wood, Moosonee, James Bay, July 17, *Nos. 4435, 4438.*

*ORTHOCAULIS ATLANTICUS (Kaal.) Buch. On peat soil, above Lake Nemaska, July 30, *No. 4466.* Dr. Evans writes: "I think that it must have been included in the "Preliminary list of Hepaticae of Europe and America (North of Mexico)" on the authority of Buch, since I have no North American material except yours. The species is distinctly northern in its distribution" (*in litt.*).

ORTHOCAULIS KUNZEANUS (Hueben.) Buch. On moist dolomitic rocks, Lake Mistassini, central islands, August 13, *No. 4302.*

PLECTOCOLEA CRENULATA (Smith) Evans. Under pines, above Lake Nemaska, July 30, *Nos. 4487, 4522.*

PLECTOCOLEA CRENULIFORMIS (Aust.) Mitt. Wet bank, below Lake Nemaska, July 27, *No. 4557* (det. Lois Clark).

PLECTOCOLEA HYALINA (Lyell) Mitt. Wet path, above Lake Nemaska, July 30, *No. 4545;* Marten River, above Lake Sand, August 5, *No. 4242.*

SPHENOLOBUS MINUTUS (Crantz) Steph. Under pines, above Lake Nemaska, July 30, *Nos. 4497, 4499a;* on moist dolomitic rocks, Lake Mistassini, central islands, August 10, *No. 4311.*

MARSUPELLACEAE

MARSUPELLA EMARGINATA (Ehrh.) Dumort. On stone in brook, Marten River, about Lake Camousitchouan, August 5, *No. 4358.*

PLAGIOCHILACEAE

PLAGIOCHILA ASPLENIOIDES (L.) Dumort. On dolomitic rock, Lake Mistassini, central islands, August 13, *No. 4266* (det. Fulford).

SCAPANIACEAE

SCAPANIA IRRIGUA (Ness) Dumort. Under pines, above Lake Nemaska, July 30, *No. 4487;* peat-bog, above Lake Sand, August 5, *No. 4347.*

SCAPANIA UNDULATA (L.) Dumort. Wet bank, below Lake Nemaska, July 26, *No. 4605;* above Lake Nemaska, July 30, *No. 4534.*

FRULLANIACEAE

FRULLANIA BOLANDERI Aust. On trunk of poplar. Plum Pudding Portage, July 22, *No. 4583.*

PELLIACEAE

PELLIA EPIPHYLLA (L.) Corda. Wet bank, below Lake Nemaska, July 26, *No. 4618.*

RICCARDIACEAE

RICCARDIA LATIFRONS Lindb. On rotten stump, Moosonee, James Bay, July 17, *No. 4436.*

MARCHANTIACEAE

PREISSIA QUADRATA (Scop.) Nees. On moist dolomitic bank, Lake Mistassini, central islands, August 12, *No. 4252.*

MOSSES

ANDREAEACEAE

ANDREAEA RUPESTRIS Hedw. On granitic rock, above Lake Nemaska, July 30, *No. 4499.*

TETRAPHIDACEAE

TETRAPHIS PELLUCIDA Hedw. On rotten stump, above Lake Nemaska, July 30, *No. 4469.*

POLYTRICHACEAE

ATRICHUM sp. nov. Wet sandy bank, Four Portages, July 24, *No. 4548.* (Will be described by Dr. T. C. Frye.)

POLYTRICHUM COMMUNE Hedw. On dry granitic rock, between Plum Pudding and Chigaskatagan Portages, July 23, *No. 4502;* along

Four Portage, July 24, *No. 4549;* on granitic rock, Oatmeal Portage, July 26, *No. 4470;* above Lake Nemaska, July 30, *No. 4486.*

POLYTRICHUM JUNIPERINUM Hedw. Peat-bog, Moosonee, James Bay, July 17, *Nos. 4405, 4430;* on dolomitic rocks, Lake Mistassini, central islands, August 10, *No. 4270.*

POLYTRICHUM PILIFERUM Hedw. On granitic rocks, Oatmeal Portage, July 26.

FISSIDENTACEAE

FISSIDENS ADIANTOIDES Hedw. On moist dolomitic rock, Lake Mistassini, central islands, August 12, *No. 4250.*

FISSIDENS OSMUNDIOIDES Hedw. On wet bank, above Lake Nemaska, July 29, *No. 4523.*

DITRICHACEAE

DISTICHIUM CAPILLACEUM (Hedw.) Bry. Eur. On dolomitic rocks: Lake Mistassini, central islands, August 10, *No. 4246;* August 12, *Nos. 4237, 4275, 4278, 4283, 4294;* August 14, *No. 4261.*

DITRICHUM FLEXICAULE (Schwaegr.) Hampe. On dolomitic rock, Lake Mistassini, central islands, August 15, *No. 4307* (det. Steere).

SELIGERIACEAE

BLINDIA ACUTA (Hedw.) Bry. Eur. Wet bank, Marten River, July 31, *No. 4368* (det. Grout).

DICRANACEAE

*DICRANELLA SCHREBERI (Hedw.) Schimp. Wet sandy shore, Lake Nemaska, July 28, *No. 4590* (det. Grout).

DICRANUM BERGERI Bland. On peat soil, Oatmeal Portage, July 25, *No. 4477* (det. Grout); on peat soil, Marten River, about Lake Kokomenhani, August 5, *No. 4357.*

DICRANUM ELONGATUM Schleich. On moist dolomitic rocks, Lake Mistassini, central islands, August 12, *No. 4304.*

DICRANUM FUSCESCENS Turn. On soil, Lake Nemaska, July 27, *No. 4595* (det. Grout).

DICRANUM MONTANUM Hedw. On granitic rock, above Oatmeal Portage, July 26, *No. 4612.*

DICRANUM RUGOSUM (Hoffm.) Brid. On peat soil, Moosonee, James Bay, July 17, *No. 4418.*

DICRANUM VIRIDE (Sull & Lesq.) Lindb. On rotten stump, Moosonee, James Bay, July 17, *No. 4411;* on wet sand, Lake Nemaska, July 27, *No. 4598.*

ONCOPHORUS POLYCARPUS (Hedw.) Brid. On granitic rocks, above Lake Nemaska, July 30, *Nos. 4500, 4501.*

ONCOPHORUS POLYCARPUS var. STRUMIFERUS (DeNot.) Grout. Oatmeal Portage, July 25, *No. 4563;* on sand and rotten wood, Peat Island, below Lake Nemaska, *Nos. 4608, 4611* (det. Grout).

ONCOPHORUS VIRENS (Hedw.) Brid. On wet sandy shore, Plum Pudding Portage, July 22, *No. 4593;* on moist dolomitic wall, Lake Mistassini, central islands, August 12, *Nos. 4259, 4332;* August 13, *No. 4327.*

ONCOPHORUS WAHLENBERGII Brid. On moist dolomitic rock, Lake Mistassini, central islands, August 12, *Nos. 4248, 4288.*

ENCALYPTACEAE

ENCALYPTA RHABDOCARPA Schwaegr. On dolomitic rocks, Lake Mistassini, central islands, August 12, *No. 4279* (det. Flowers); August 15, *No. 4308* (det. Flowers).

POTTIACEAE

GYMNOSTOMUM CALCAREUM Nees & Hornsch. On moist dolomitic rocks, Lake Mistassini, central islands, August 12, *Nos. 4249, 4354* (det. Steere), August 15, *No. 4344* (det. Steere).

GYMNOSTOMUM RECURVIROSTRUM Hedw. On moist dolomitic rocks, Lake Mistassini, central islands, August 14, *No. 4289,* August 15, *Nos. 4262, 4340.*

GYMNOSTOMUM RECURVIROSTRUM var. COMMUTATUM (Mitt.) Dixon. On moist dolomitic rock, Lake Mistassini, central islands, August 15, *No. 4257.*

TORTELLA TORTUOSA (Turn.) Limpr. On dolomitic rock, Lake Mistassini, central islands, August 10, *No. 4330,* August 12, *No. 4353.*

TORTULA RURALIS (Hedw.) Smith. On clayey slope, Rupert House, James Bay, July 20, *No. 4551;* on dolomitic rock, Lake Mistassini, central islands, August 12, *No. 4240.*

GRIMMIACEAE

GRIMMIA ALPICOLA Hedw. On moist granitic rocks, below Lake Mistassini, August 7, *Nos. 4333, 4337.*

GRIMMIA ALPICOLA var. RIVULARIS (Brid.) Broth. On Laurentian gneisses, Four Portages, July 24, *Nos. 4515, 4517* (det. Steere).

GRIMMIA COMMUTATA Hueben. On Laurentian gneiss, between Plum Pudding and Chigaskatagan Portages, July 23, *No. 4508* (det. Steere); on rocks, Four Portages, July 24, *No. 4514* (det. Steere); on granitic rocks, Marten River, about Lake Tesekau, August 1, *No. 4447* (det. Steere).

*GRIMMIA PILIFERA Beauv. On dolomitic rock, Lake Mistassini, central islands, August 13, *No. 4272.*

GRIMMIA UNICOLOR Hook. On moist granitic rock, Four Portage, July 24, *No. 4518* (det. Steere).

HEDWIGIA CILIATA Hedw. On granitic rock, Four Portages, July 24, *No. 4513.*

RHACOMITRIUM CANESCENS Brid. On sand, Peat Island, below Lake Nemaska, July 26, *No. 4609.*

RHACOMITRIUM CANESCENS f. ERICOIDES (Brid.) Moenkem. On sand, Plum Pudding Portage, July 22, *No. 4592.*

RHACOMITRIUM FASCICULARE (Hedw.) Brid. On granitic rocks, above Oatmeal Portages, July 26, *No. 4613.*

RHACOMITRIUM HETEROSTICHUM (Hedw.) Brid. On sand, Peat Island, below Lake Nemaska, July 36, *No. 4555.*

*RHACOMITRIUM HETEROSTICHUM var. AFFINE (Schleich.) C. Jens. On granitic rocks, Plum Pudding Portage, July 22, *N. 4570.*

RHACOMITRIUM HETEROSTICHUM var. RAMULOSUM (Lindb.) Jones On granitic rocks, Oatmeal Portage, July 25, *No. 4564;* above Lake Nemaska, July 29, *No. 4527;* below Lake Nemaska, July 30, *No. 4532a;* between Lakes Sand and Camousitchouan, August 4, *No. 4297.*

SPLACHNACEAE

*SPLACHNUM RUBRUM Hedw. On moist dolomitic rock, Lake Mistassini, central islands, August 12, *No. 4329* (det. Andrews).

TETRAPLODON ANGUSTATUS (Hedw.) Bry. Eur. On peat soil, Lake Mistassini, central islands, August 12, *No. 4345.*

TETRAPLODON MNIOIDES (Hedw.) Bry. Eur. On granitic rock, above Lake Nemaska, July 30, *No. 4533;* on peat soil, Lake Mistassini, central islands, August 12, *No. 4345.*

ORTHOTRICHACEAE

ORTHOTRICHUM ANOMALUM Hedw. On dolomitic rocks: Lake Mistassini, central islands, August 12, *Nos. 4313* (det. Grout), *4303;* August 13, *No. 4272a.*

ORTHOTRICHUM ELEGANS Hook. & Grev. On Laurentian gneiss, Four Portages, July 24, *No. 4516a.*

*ORTHOTRICHUM GARRETTI Grout & Flowers. On sandy path, above Lake Robert, August 3, *No. 4362.* Apparently new to Canada. Grout's "Moss Flora" makes mention of the type locality merely: Emma Park, Carbon Co., Utah (*Flowers no. 834*), May 8, 1928. It is a "very good find" according to Dr. Wareham.

ORTHOTRICHUM MICROBLEPHARUM Schimp. forma. On wet sand, Leke Nemaska, July 27, *No. 4599* (det. Grout).

ULOTA AMERICANA (Beauv.) Limpr. On wet sand, Lake Nemaska, July 27, *No. 4598* (det. Grout).

AULACOMNIACEAE

AULACOMNIUM PALUSTRE (Web. & Mohr) Schwaegr. Peat-bog, Moosonee, James Bay, July 17, *Nos. 4405, 4419, 4433;* on wet sand, Lake Nemaska, July 27, *No. 4596.*

BARTRAMIACEAE

CATASCOPIUM NIGRITUM Brid. On dolomitic rock, Lake Mistassini, central islands, August 12, *No. 4315;* August 13, *No. 4352;* August 15, *No. 4306.*

PLAGIOPUS OEDERI (Brid.) Limpr. On moist dolomitic rocks, Lake Mistassini, central islands, August 12, *No. 4278.*

MEESIACEAE

MEESIA ULIGINOSA Hedw. On moist dolomitic rocks, Lake Mistassini, central islands, August 12, *Nos. 4287a* (det. Andrews), *4274, 4314, 4393;* August 13, *No. 4300* (det. Andrews); August 15, *No. 4265.*

BRYACEAE

BRYUM BIMUM Schreb. Swampy peat-bog, Moosonee, James Bay, July 17, *No. 4404;* on moist dolomitic rock, Lake Mistassini, central islands, August 12, *Nos. 4274, 4287, 4287a;* (all dét. by Andrews).

BRYUM CAPILLARE (L.) Hedw. On wet sandy path, above Lake Robert, August 3, *No. 4362.*

BRYUM CUSPIDATUM (Bry. Eur.) Schimp. On clayey slope, Rupert House, James Bay, July 20, *No. 4509* (det. Andrews). On rotten wood, *No. 4559;* swampy place, along Plum Pudding Portage, July 22, *No. 4580* (det. Andrews).

BRYUM PSEUDOTRIQUETRUM (Hedw.) Schwaegr. On moist dolomitic rocks, Lake Mistassini, central islands, August 12, *No. 4291,* August 13, *No. 4298.*

BRYUM TURBINATUM (Hedw.) Schwaegr. Swampy place, Moosonee, James Bay, July 16, *No. 4399,* July 17, *No. 4407;* on clayey soil, Rupert House, James Bay, July 20, *No. 4562;* on granitic rock, Four Portages, July 24, *No. 4515;* (all specimens det. by Andrews).

POHLIA NUTANS (Hedw.) Lindb. On wet sand, Peat Island, below Lake Nemaska, July 26, *No. 4556;* on granitic rock, above Oatmeal Portage, July 26, *No. 4472;* on peat soil, above Lake Nemaska, July 30, *No. 4323;* on wet shore, below Lake Mistassini, August 8, *No. 4346;* (all specimens det. by Andrews).

POHLIA PROLIGERA Lindb. On dolomitic rock, Lake Mistassini, central islands, August 10, *Nos. 4269, 4270* (det. Andrews).

MNIACEAE

CINCLIDIUM STYGIUM Sw. On dolomitic rock, Lake Mistassini, central islands, August 12, *No. 4305.*

MNIUM PUNCTATUM Hedw. Peat-bog, Moosonee, James Bay, July 17, *Nos. 4421, 4427* (det. Andrews).

HYPNACEAE

AMBLYSTEGIUM SERPENS (Hedw.) Bry. Eur. On rotten stump, Rupert House, James Bay, July 20, *Nos. 4559, 4559a.*

BRACHYTHECIUM FLAGELLARE (Hedw.) Jennings. On granitic rock, Four Portages, July 24, *No. 4516* (det. Grout).

BRACHYTHECIUM OXYCLADON (Brid.) Jaeger & Sauerb. On moist dolomitic rocks, Lake Mistassini, central islands, August 13, *No. 4254* (det. Grout).

CALLIERGON CORDIFOLIUM (Hedw.) Kindb. In swamp, Moosonee, James Bay, July 16, *No. 4401* (aquatic phase); in springy place, Plum

Pudding Portage, July 22, *No. 4579;* in swamp, Lake Mistassini, July 10, *No. 4309* (aquatic phase) (all specimens det. by Dr. Wynne).

CALLIERGON RICHARDSONI (Mitt.) Kindb. In wet peat-bog, Moosonee, James Bay, July 17, *No. 4420* (det. Wynne).

CALLIERGON STRAMINEUM (Brid.) Kindb. Along Plum Pudding Portage, July 22, *No. 4573* (det. Wynne).

CALLIERGONELLA SCHREBERI (Bry. Eur.) Grout. Common in coniferous forest, from James Bay as far as Lake Mistassini.

*CAMPTOTHECIUM LUTESCENS (Hedw.) Bry. Eur. In swampy place in peat-bog, Moosonee, James Bay, July 17, *Nos. 4403, 4423;* on dolomitic rocks, Lake Mistassini, central islands, August 13, *No. 4298,* August 15, *No. 4265.*

CAMPYLIUM HALLERI (Hedw.) Lindb. On dolomitic rock, Lake Mistassini, central islands, August 13, *No. 4285.*

CAMPYLIUM RADICALE (Beauv.) Grout. On moist dolomitic rock, Lake Mistassini, central islands, August 12, *No. 4259.*

CLIMACIUM DENDROIDES (Hedw.) Web. & Mohr. On moist granitic rock, below Lake Mistassini, August 7, *Nos. 4334, 4339.*

CRATONEURON FALCATUM (Brid.) Roth. On moist dolomitic rock, Lake Mistassini, central islands, August 13, *No. 4271.*

CRATONEURON FILICINUM (Hedw.) Roth. On dolomitic rock, Lake Mistassini, central islands, August 15, *No. 4265.*

DREPANOCLADUS ADUNCUS (Hedw.) Warnst. Rupert House, James Bay, July 20, *No. 4558* (short-celled phase; det. Wynne).

DREPANOCLADUS ADUNCUS var. TYPICUS (Ren.) Wynne. On moist granitic rocks, between Plum Pudding and Chigaskatagan Portages, July 23, *No. 4507* (short-celled phase; det. Wynne).

DREPANOCLADUS ADUNCUS var. KNEIFFII (Bry. Eur.) Moenkem. Peat-bog, Moosonee, James Bay, July 17, *No. 4434* (short-celled phase; det. Wynne).

DREPANOCLADUS EXANNULATUS (Bry. Eur.) Warnst. In swamp, Moosonee, James Bay, July 17, *No. 4406;* in swamp, Plum Pudding Portage, July 22, *No. 4575;* in pool on granitic rock, about Robert Lake, August 3, *No. 4374* (all specimens det. by Dr. Wynne).

DREPANOCALDUS FLUITANS (Hedw.) Warnst. Wet shore, Lake Mistassini, August 9, *No. 4442* (det. Wynne).

DREPANOCLADUS REVOLVENS (Turn.) Warnst. On clayey slope, Rupert House, James Bay, July 20, *No. 4552;* on moist dolomitic rock, Lake Mistassini, central islands, August 12, *No. 4282* (both specimens det. by Wynne).

DREPANOCLADUS UNCINATUS (Hedw.) Warnst. At base of tree, Four Portages, July 24, *No. 4546;* on moist granitic rock, above Lake Nemaska, July 29, *Nos. 4496, 4520, 4521;* on granitic boulder, below Lake Mistassini, August 8, *No. 4348* (all specimens det. by Wynne).

DREPANOCLADUS VERNICOSUS (Lindb.) Warnst. In swampy place, Moosonee, James Bay, July 16, *No. 4399* (det. Wynne).

HYGROAMBLYSTEGIUM FLUVIATILE (Hedw.) Loeske. On moist granitic rock, below Lake Mistassini, August 7, *Nos. 4336, 4336a.*

HYGROHYPNUM PALUSTRE (Hedw.) Loeske. In swampy place, Moosonee, James Bay, July 16, *No. 4400* (det. Wynne); on moist dolomitic rocks, Lake Mistassini, central islands, August 13, *No. 4263* (appr. var. *julaceum* (Bry. Eur.) Loeske (det. Grout), *No. 4301* (det. Grout), *No. 4328* (det. Wynne).

HYLOCOMIUM SPLENDENS (Hedw.) Bry. Eur. On moist dolomitic rock, Lake Mistassini, central islands, August 15, *No. 4340*. Frequent with *Calliergonella Schreberi* in coniferous forest, from James Bay up to Lake Mistassini.

HYPNUM CUPRESSIFORME Hedw. On dolomitic rock, Lake Mistassini, central islands, August 12, *No. 4239*.

*HYPNUM FASTIGIATUM Brid. On dolomitic rock, Lake Mistassini, central islands, August 12, *No. 4353* (det. Grout). "An alpine calcicolous moss very rare in N. America." (Moss Flora 3: 131).

HYPNUM PALLESCENS (Hedw.) Bry. Eur. On rotten trunk, Rupert House, James Bay, July 20, *No. 4512*.

HYPNUM PATIENTIAE Lindb. On wet shore, Four Portages, July 24, *No. 4547*.

HYPNUM VAUCHERI Lesq. On moist dolomitic rock, Lake Mistassini, central islands, August 12, *No. 4251* (det. Steere).

LEPTODICTYUM RIPARIUM (Hedw.) Warnst., f. *longifolium* Schultz. On wet shore, upwards Lake Nemaska, July 29, *No. 4525a*.

PYLAISIA POLYANTHA Bry. Eur. On tree, along Four Portages, July 24, *No. 4550*.

PYLAISIA SUBDENTICULATA Schimp. On willow, Rupert River, July 22, *No. 4591a*.

RHYTIDIADELPHUS TRIQUETRUS (Hedw.) Warnst. On a little moist soil on dolomitic rock, Lake Mistassini, central islands, August 15, *No. 4273*.

RHYTIDIUM RUGOSUM (Hedw.) Kindb. On moist dolomitic rocks, Lake Mistassini, central islands, August 12, *Nos. 4238, 4260, 4284*.

SCORPIDIUM SCORPIOIDES (Hedw.) Limpr. On wet shore, above Lake Nemaska, July 29, *No. 4524*.

LESKEACEAE

HELODIUM BLANDOWII (Web. & Mohr) Warnst. Peat-bog, Moosonee, James Bay, July 17, *No. 4431* (det. Grout).

MYURELLA JULACEA (Schwaegr.) Bry. Eur. On dolomitic rocks, Lake Mistassini, central islands, August 12, *Nos. 4237, 4275, 4281, 4283, 4354*, August 14, *No. 4261*.

FONTINALACEAE

DICHELYMA FALCATUM (Hedw.) Myrin. Under water on stones in brook, Marten River, August 1, *No. 4445* (det. Welch); in same habitat, above Lake Robert, August 3, *No. 4365*.

FONTINALIS ANTIPYRETICA Hedw. In a brook, Moosonee, James Bay, June 23, 1944, *No. 6194* (det. Welch).

FONTINALIS DALECARLICA Bry. Eur. In the Marten River, 25 miles from Lake Nemaska, July 31, *Nos. 4379, 4553;* in running water, Marten River, above Lake Robert, August 4, *No. 4312* (all specimens det. by Welch).

FONTINALIS DURIAEI Schimp. In a brook, Moosonee, James Bay, June 22, 1944, *No. 6199* (det. Welch).

FONTINALIS NOVAE-ANGLIAE Sull. In running water, Marten River, 25 miles from Lake Nemaska, July 31, *No. 4366* (det. Welch); Lake Camousitchouan, August 4, *No. 4377* (det. Welch).

SPHAGNACEAE

SPHAGNUM CAPILLACEUM (Weiss) Schrank. In swamp, Oatmeal Portage, July 25, *No. 4458.*

SPHAGNUM CAPILLACEUM var. TENELLUM (Schimp.) Andrews. In swamp, Oatmeal Portage, July 25, *No. 4459;* above Lake Nemaska, July 30, *No. 4464.*

SPHAGNUM DUSENII C. Jens. In swamp, Lake Nemaska, July 27, *Nos. 4606, 4607;* in a brook, Lake Tesekau, August 2, *No. 4380.*

SPHAGNUM FUSCUM (Schimp.) H. Klinggr. In swamp, Moosonee, James Bay, July 17, *Nos. 4410, 4417, 4428.*

SPHAGNUM GIRGENSOHNII Russow. In swamp, above Lake Nemaska, July 30, *No. 4463.*

SPHAGNUM MAGELLANICUM Brid. In swamp, Moosonee, James Bay, July 17, *No. 4408;* Oatmeal Portage, July 25, *No. 4459a.*

SPHAGNUM PAPILLOSUM Lindb. In swamp, Marten River, August 5, *No. 4356.*

SPHAGNUM RECURVUM Beauv. In swamp, Moosonee, James Bay, July 17, *No. 4422;* above Lake Nemaska, July 29, *No. 4526;* peat-bog, Marten River, August 1, *No. 4359.*

SPHAGNUM RECURVUM var. TENUE H. Klinggr. In swamp, Oatmeal Portage, July 25, *No. 4459a.*

SPHAGNUM SUBSECUNDUM Nees. In swamp, between Plum Pudding and Chigaskatagan Portages, July 23, *No. 4505;* above Lake Nemaska, July 29, *Nos. 4525, 4526;* in pool, Marten River, July 31, *No. 4367;* on wet granitic rock, Marten River, August 1, *No. 4443.*

SPHAGNUM TERES (Schimp.) Aongstr. In swamp, Moosonee, James Bay, July 16, *No. 4398.*

SPHAGNUM WARNSTORFII Russow. In swamp, Moosonee, James Bay, July 16, *No. 4398,* July 17, *No. 4402.* (All the Sphagnaceae were det. by Dr. Andrews.)

SCHOOL OF AGRICULTURE
RIMOUSKI, QUEBEC, CANADA.

FRULLANIA ATRATA

LOIS CLARK AND RUTH DOWELL SVIHLA

FRULLANIA ATRATA Nees, G. L. & N., Syn. Hep. 463, 1845.
Jungermannia atrata Sw., Prodr. Ind. Occ. 144, about 1806.

Plants from almost black to very dark brown or green, prostrate, pendulous or hanging from trees in mats, rigid, to 30 cm. long, 0.5 to 75 mm. wide, irregularly and sparingly pinnate. Stems brown or black, averaging 146 μ in diameter, 1/3 or less the width of the leafy shoot. Stem cells in cross section composed of an epidermal layer of brown cells which average 13 μ in diameter, with thick walls, and light-colored interior cells of similar size with thin walls. Dorsal lobe of leaf 328 to 438 μ long, 215 to 365 μ wide, subimbricate, wrapped about the stem or spreading obliquely to suberect, ovate to subrotund, acuminate or apiculate to rarely subacute; base circinnately appendiculate, extending beyond the stem ½ to 2 times the stem width; margin entire, recurved. Ventral lobe of leaf narrowly cylindrical, 219 to 225 μ long, 65 to 70 μ wide, approximately 3 to 4 times as long as wide, parallel to stem, sometimes explanate; mouth truncate. Cells of dorsal lobe with thick walls on leaves of main branches, with thinner walls on leaves of young growth; trigones large; intermediate thickenings present throughout; apical cells averaging 16 by 10 μ; basal 43 by 15 μ. Underleaves 265 to 300 μ long, 146 to 213 μ wide, about ½ as large in area as dorsal lobe of leaf, ovate to lanceolate, sometimes appearing narrowly oblong because of the recurved margin, bilobed ⅓ to ¼ of length; base strongly auriculate; margin entire and strongly recurved laterally. Stylus small, subulate, usually of 3 to 5 cells. Plants bisexual. Male inflorescence a short ovoid to obovoid lateral branch, or the base of a lateral branch; male bracts 3 to 6 pairs, bilobed, the lobes about equal in size; margin entire except for a tooth on the inner edge of the ventral half. Male bracteole subquadrate, either free or united on one side with a bract, bilobed; sinus acute to obtuse, extending ½ the length of the bracteole when well-developed; lobes acute; margin entire. Female inflorescence on a short branch; female bracts bilobed. Dorsal lobe slightly the larger, oblong to ovate, averaging 1.24 mm. long and 0.4 mm. wide; apex apiculate; margin entire to sinuate or with a few teeth near apex. Ventral lobe lanceolate or oblong, averaging 1.26 mm. long, 0.3 mm. wide; apex apiculate; margin sometimes recurved, dentate on the inner side with one or more long slender teeth one of which represents the stylus. Female bracteole free from the bracts, ovate, averaging 1.3 mm. long, 0.55 mm. wide, bilobed; sinus acute, extending ½ the length of the bracteole; apex accuminate; margin dentate, with cilia near the base. Mature perianth about ⅓ emergent, obovoid, about 1.75 mm. long and 0.73 mm. wide; keels one ventral and two lateral; surface without tubercles or scales, smooth; mouth with a rather long beak, the cells of which have bulging inner sides.

Reported from Mexico, West Indies, Venezuela, Guiana, Brazil, Bolivia and Ecuador.

Specimens examined: JAMAICA; at New Haven Gap in Blue Mountains, pendant from limbs of trees, altitude 5400 ft. (*P. M. Patterson L–11*) July 4, 1932. PUERTO RICO: Sierra de Luquillo, fog forest near summit of El Duque, hanging from shrubby trees (*W. C. Steere 4116, 4139*) Sept. 29, 1939; just below summit of El Yunque, on bare rock (*W. C. Steere 4293*) Oct. 7, 1939; cloud forest on ridges leading to El Toro, hanging from twigs (*W. C. Steere 4374*) Oct. 12, 1939; summit of El Yunque, on bare rock (*W. C. Steere 4401*) Oct. 14, 1939; extreme summit of La Torrecilla, northwest of Barranquitas, on twigs of shrubby tree (*W. C. Steere 4634*) Oct. 28, 1939; Sierra de Cayey, Guavate Purchase Unit, ridge leading to La Cruceta, on twigs of exposed trees (*W. C. Steere 4759*) Nov. 3, 1939; Cordillera Central south of Jayuya, trail east of Cerro de la Punta, on upper twigs of trees (*W. C. Steere 6234*) Jan. 20, 1940; peak at Kilometer 10, on small tree (*W. C. Steere 6704, 6731*) Mar. 1, 1940. GUADELOUPE; (*L'Herminier*) without date. TRINIDAD: Mt. Tocuches, hanging from trees (*E. G. Britton and others 1492*). GUATEMALA; (*Fredriechsthal*) without date. COSTA RICA: Vera Blanca (*R. D. Svihla 41487*) July 12, 1941. ECUADOR: (*Allioni 162*) July, 1910; (*Allioni 423*) June, 1911.

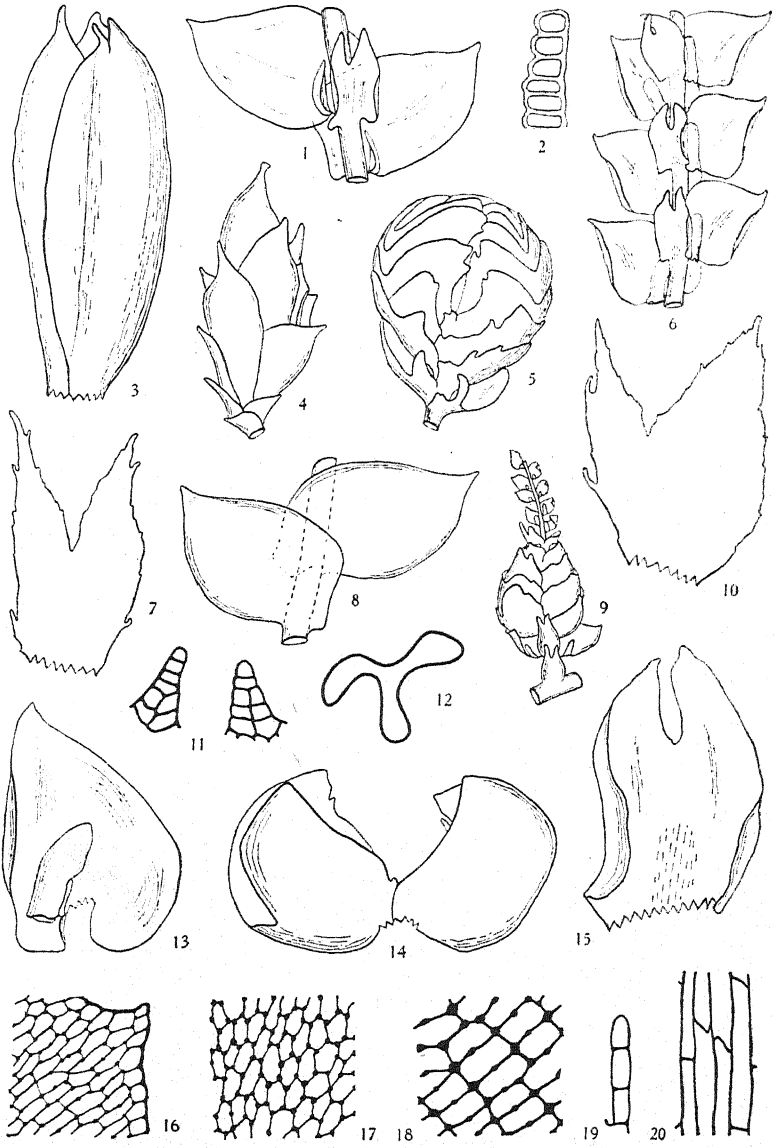
The labels on the packets of Allioni from Ecuador are hand written and although the localities are given, they are unreadable to us. To the best of our knowledge, this is the first published record of this species from Guatemala and Costa Rica.

Nees (Syn. Hep. 464, 1845) has described 4 varieties, the differences between which are so slight that we have not been able to distinguish them from the species as a whole.

Plate by courtesy of the University of Washington.

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON

Figs. 1–20. FRULLANIA ATRATA. 1. Ventral view of plant with explanate ventral lobes, × 39. 2. Cells of the perianth beak in profile with bulging inner sides, × 230. 3. Perianth, × 28. 4. Young female inflorescence, × 15. 5. Young male inflorescence forming obovoid head, × 39. 6. Ventral view of plant, × 28. 7. Female bracteole, × 28. 8. Dorsal view of plant, × 39. 9. Male inflorescence at base of new vegetative growth, × 15. 10. Female bract, × 28. 11. Tips of two dorsal lobes of leaves, × 230. 12. Cross-section of mid-perianth, × 28. 13. Ventral view of leaf, × 51. 14. Pair of male bracts, × 64. 15. Underleaf, × 125. 16. Apical leaf cells, × 230. 17. Median leaf cells, × 230. 18. Basal leaf cells, × 230. 19. Stylus, × 230. 20. Surface cells of stem, × 450.



FIGS. 1–20, FRULLANIA ATRATA

TAXONOMIC NOTES V. THE GENUS TETRAPTERUM

A. LEROY ANDREWS

The days when the cleistocarpous mosses formed a taxonomic group by themselves are long since past and now probably no bryologist would deny the obviously close relationship of the present genus *Astomum* with *Hymenostomum; Physcomitrella* or *Aphanorhegma* with *Physcomitrium;* and some species at least of *Phascum* with *Pottia.* However, not all genera of cleistocarps are so easily placed, *Archidium* and *Ephemerum* for example seem to have defied placement and various other genera and species have not been too definitely accounted for.

Besides *Astomum* and *Phascum* a number of other cleistocarpous genera have been included, probably correctly, within the family Pottiaceae, whose relations however to each other and to the more highly organized genera of the family are in need of further study. Such a genus is *Tetrapterum,* which like many another has had a checkered career in bryological history. The generic name, applied because the spore capsule of the type species from South Africa was regarded as quadrangular rather than rounded in section, goes back to Hampe (*in litt.*) according to Carl Müller.[1] Müller himself, it is true, included the species under *Phascum,* but Hampe's name, which Müller cited without especial disapproval, is so unmistakably connected with a definite species that the publication may well be regarded as adequate.[2] Brotherus in his first treatment of the mosses in Engler and Prantl's "Natürliche Pflanzenfamilien"[3] gave no recognition whatever to the genus, including its species in the subgenus *Euastomum* of the genus *Astomum.* In this he was followed uncritically by Georg Roth[4] in his first and only published volume of "Die auszereuropäischen Laubmoose." I expressed disagreement in my notes on *Astomum-Hymenostomum*[5] and Brotherus in his second edition[6] then gave *Tetrapterum* an independent position in close proximity to *Astomum,* including in it besides the original South African species 5 Australian species, one of which had already been associated with it, and 5 South American species, the latter 5 with one exception appearing in Roth under *Phascum.* Herzog accepted the 11 species of Brotherus without question.[7]

[1] Synopsis Musc. Frond. **1**: 29. 1848.
[2] Hampe employed the name himself in 1853 (Linnaea **26**: 489) for another species, but obviously presupposing the first one, the only one that it descriptively fits.
[3] **1**[3]: 385. 1902.
[4] **1**: 192, with pl. 17, Nr. 2. 1911.
[5] THE BRYOLOGIST **23**: 30. 1920.
[6] **10**: 253. 1924.
[7] Geographie der Moose 96. 1926.

The type species from South Africa was first described as *Phascum tetragonum* and figured in color by Hooker in the first volume of his Botanical Miscellany.[8] By Müller it was, following some kind of a slip of Schwaegrichen, credited to Harvey and subsequent botanists have for the most part faithfully continued to cite Harv., even when employing the later specific name *capense* for it.[9] Hooker certainly took full responsibility for the name and recognition of the species and it was credited to him by Taylor a few years later. Taylor compared it with the other (Australian) species commonly associated with it, which he described in 1846[10] as *Phascum cylindricum*. The latter species was renamed *Tetrapterum australe* by Hampe in 1853[11] and Jaeger in 1869[12] likewise used a second specific name *capense* for the South African species, which he also credited to Hampe (*in litt.*). This name has been extensively employed since in disregard of priority and so far as I can discover the proper combination *Tetrapterum* **tetragonum** (Hook.) has never yet been made. It remains to be said that Schwaegrichen furnished a good description and figure of the type species[13] as *Phascum tetragonum* Harv. and Sim[14] also described and figured it as *Tetrapterum capense* (Hpe.) Jaeg. Paris in the second edition of his Index Bryologicus[15] placed it in *Systegium* (synonym of *Astomum*) as *S. tetragonum* (Harv.) Par.

As to the value and extent of the genus *Tetrapterum* and its relation to other, especially more highly developed genera, there have been somewhat diverse opinions. The early use of *Phascum* does not signify much, as it is an old Linnean name employed for many and various cleistocarpous mosses up to about the middle of the nineteenth century, when a more natural view of relationships of the cleistocarps was gradually developing. By those who recognized *Tetrapterum* as an independent genus only one other besides the type species was included until Brotherus in his second edition (1924) incorporated 9 more. By those not recognizing it as independent it was regularly included in what is generally called *Astomum*. The other species usually associated with the South African type is *Phascum cylindricum* Tayl. noted

[8] **1**: 124, pl. 31. 1829 (not 1830).
[9] Harvey would have been about 18 at the time of its publication and his acquaintance with Hooker came somewhat later and his South African experience and publications later still.
[10] (Hooker's) London Journal of Botany **5**: 42. 1846.
[11] Linnaea **26**: 489. 1853; (published as a synonym).
[12] Musci cleistocarpi, Separatabdruck aus den Verh. d. St. Gall. naturwiss. Gesellschaft **1869**: 26.
[13] Suppl. **4**: pl. 303a. 1842.
[14] Bryophyta of South Africa 254. 1926.
[15] **4**: 354. 1905.

above. It does not however have the tetragonal capsule, but a somewhat cylindrical one with round cross-section as the name suggests and also differs in its leaf characters to such an extent that I can see no reason for keeping it with it, but would regard it as requiring treatment with the other mosses included in *Astomum*. Its capsule is somewhat more elongated than generally in this group, but in other respects it agrees well. The same is true in still higher degree of the other species included by Brotherus, so far as I can judge from specimens of several species available and Roth's illustrations for the rest.

The features that separate the South African from all other species with which it has been generically associated are in the first place its capsule and in the second place its leaf structure. As to the capsule the matter is not quite so simple as at first represented. The upper part of the capsule, which would correspond to the operculum, if the moss were not cleistocarpous, does appear to have, at any rate in herbarium specimens, a quadrangular section with alternating projections and depressions, as emphasized by Hooker and illustrated by Sim's figure of the cross-section. However already Schwaegrichen described and figured the section of the lower spore-bearing part of the capsule as rather hexagonal (he speaks of 6 to 8 sides) and the illustration in Engler and Prantl, credited to Paris, shows a pentagonal section. I even found a somewhat heptagonal section, one of the hexagonal sides being itself divided into two, the sides being anyhow of irregular length and the angles not sharp cut.[16] It should also be noted, as has already been done, that the ridges representing the angles do not run straight up and down the capsule, but show some irregularity of direction and extent. The section also shows that the ridges do not represent any thickening of the cuticular membrane, which is composed of a single layer of solid brown cells of essentially uniform thickness throughout, but rather correspond to conditions in the numerous and large thin-walled cells intervening between the cuticular layer and the spore-sac, which is itself round in section. What has happened is then a wrinkling of a rather loosely fitting cuticular membrane, which however seems to be a permanent condition of the ripened capsule; at any rate the cuticle is not relieved of its wrinkles by moistening. Study of fresh material in different stages of development would be of value.

As to the leaf structure, the costa is broad, but hardly fully reaches

[16] The less schematic of Schwaegrichen's two sections is exactly similarly heptagonal.

the leaf apex as contrasted with the normally slightly excurrent costa characteristic of *Astomum* and the whole *Weisia* complex, the basal part with smooth hyaline cells extends unusually far up the leaf, while the upper very papillose part is described and figured by Brotherus as having ring-shaped or "horseshoe-shaped" papillae. The latter feature I am quite unable to confirm and regard as an optical illusion. The papillae are small, prominent and so closely placed as to obscure the cellular areolation, as has been noted. I have seen the occasional ring-shaped effect, but suspect it is merely an optical section of a papilla; careful focusing reveals rounded or irregularly shaped or pointed terminations and no rings or horseshoes.

On the basis particularly of the leaf differences two attempts have been made to separate *Tetrapterum* from the *Astomum* relationship. The first was by Jaeger,[17] who placed it, though including *T. cylindricum*, with the *Hyophileae* rather than the *Weisieae*, that is, associating it with the genus *Hyophila*. The latter is a genus not very well understood or delimited and the close relationship of *Tetrapterum* to it at any rate doubtful. Hilpert, who made a praiseworthy attempt to rearrange species and genera of the *Trichostomaceae* part of the *Pottiaceae*,[18] placed the South African species, the only one he studied, in his *Barbuloideae*, that is relating it to *Barbula*, especially emphasizing its connection with *Erythrophyllum* (*Didymodon rubellus*, etc.). This might also appear doubtful. I should be inclined to leave it where it is in Engler and Prantl, if the *Weisia* complex is extended to cover *Trichostomum*, as seems to me necessary. At any rate present knowledge of the mosses and the extensive endemism of the South African flora in other respects seem to justify treating *Tetrapterum* as a monotypic genus with the sole species *T. tetragonum* (Hook.), quite confined to South Africa and evidently as yet collected in but few localities there.

ITHACA, N. Y.

[17] Loc. cit. 1869.
[18] Bot. Centralbl. 50: Abt. 2, Heft 3, Beiheft: 643. 1933.

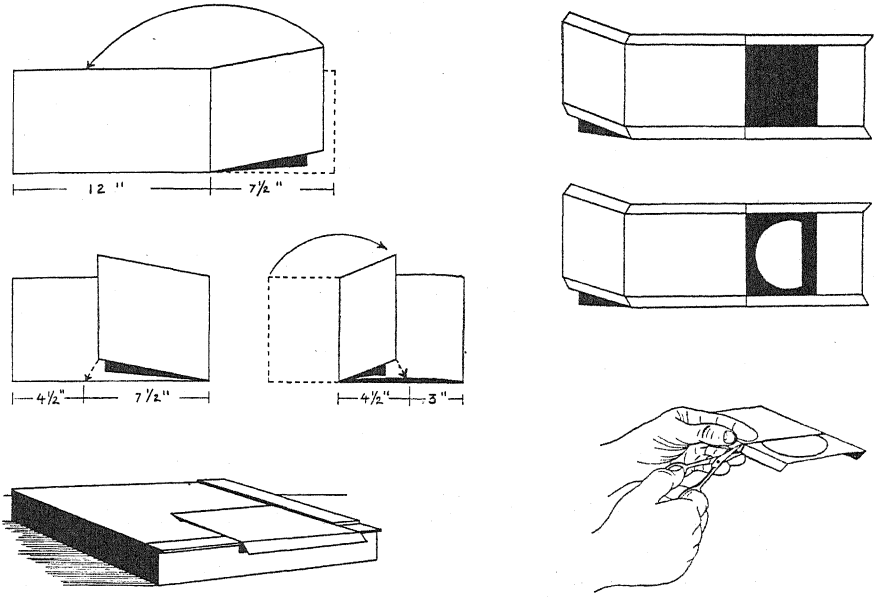
DISPLAY POCKET FOR CRYPTOGAMS

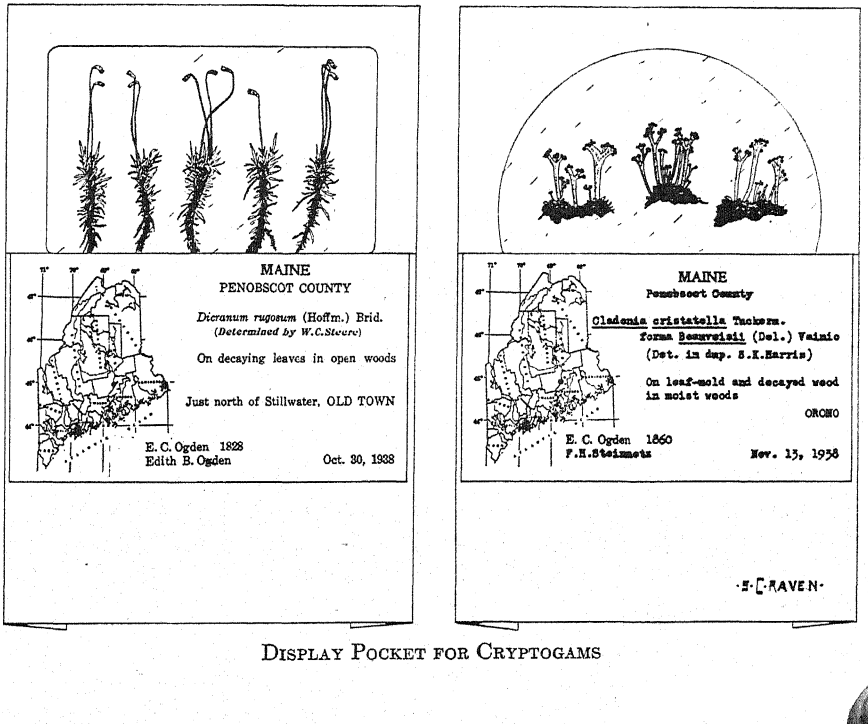
E. C. OGDEN

While the ordinary opaque pockets commonly used for holding herbarium specimens of mosses, lichens, etc. serve the purpose fairly well, there is need for a pocket that will expose some specimens to view more quickly than the regular kind. Unless the specimen can be mounted onto the sheet without a cover, as is usual with vascular plants, it will be necessary to place it into some transparent pocket, if it is to be easily and quickly seen. The idea is not at all new and some herbaria are using transparent materials in one way or another. It is not necessary that all collections be exposed to view, but it is highly desirable that one collection of each entity be readily visible. This is a big time-saver when one is attempting to match a specimen in hand. It also saves much wear and tear on the opaque pockets, for fewer of them need to be opened. The transparent pocket should be just as much a part of the herbarium as an opaque pocket and both types should be filed together. Further, the collection thus displayed should also be a regular herbarium specimen and easily removed for study when necessary. The pocket here described has been used by me for several years and has proved to be quite satisfactory. The size of the completed pocket, $5 \times 7\frac{1}{2}$ inches, has been chosen so that four such pockets may fit very nicely on a standard $11\frac{1}{2} \times 16\frac{1}{2}$ inch herbarium sheet and still be easily opened.* When but one such pocket is desired on a sheet, the space left is sufficient for the common $3\frac{1}{2} \times 5$ inch pockets, without wasting space.

The paper chosen may be the usual paper used for herbarium pockets. It should be a firm, unglazed paper lacking the chemicals that cause paper to crack and tear when folded. The size needed for one pocket is $6\frac{1}{2} \times 19\frac{1}{2}$ inches. This paper will normally be purchased in the 17×22 inch size. Each sheet makes two pockets. The unused strips along the side and end need not be wasted, but can be used for making small pockets for seeds, etc. of vascular plants. Attempts to utilize the paper more efficiently will result in pockets too wide for convenience on herbarium sheets or too narrow for most labels. The $6\frac{1}{2} \times 19\frac{1}{2}$ inch piece of paper is first folded $7\frac{1}{2}$ inches from one end and then folded again at the free end of this $7\frac{1}{2}$ inch

* Herbaria using the card-catalog system for storing such specimens may wish to use another size. See the report by Dr. Conard and his committee on the housing of a moss collection in this issue of THE BRYOLOGIST.





DISPLAY POCKET FOR CRYPTOGAMS

piece (see illustrations). Now, holding the folded paper with the 4½ inch part up, fold ¾ inch of each 7½ inch side down and under. Care must be taken to get sharp, straight folds, but it can be easily done over the edge of an ordinary paper-cutter. The folded paper is now 5 × 7½ inches.

Next, open the folded pocket and take a piece of thin, flexible, but tough, manila cardboard, or firm cloth, 4 × 4⅞ inches, and fasten it with tin paste or dry-mounting tissue to the pocket paper in the position shown in the illustration. This is the place where the opening will be cut. The manila cardboard used in the familiar correspondence folders is suitable. Book cloth is excellent but more expensive.

The next operation is cutting the opening. Two styles are shown in the plate of illustrations. Other shapes and sizes may be used. Square corners should be avoided in order to reduce the tendency to tear. The opening may be cut by using a razor blade and a metal template. For the opening illustrated at the lower right, an ordinary tin can (4 inches in diameter) makes an excellent template. With this opening the sharp corners at the bottom are not objectionable as they are covered and protected by the lower fold, which should project ⅛ inch or more above the lowest part of the opening. If a number of such pockets are to be made, a die-cutter can be constructed that will greatly simplify the work. This is easily made by bending printer's cutting rule (obtainable at any print shop) around a 1 inch block of wood that is cut to the size and shape of the opening. The rule may be fastened to the block with screws.

After the opening has been cut, a thin layer of cotton 4 × 4¾ inches and a piece of celluloid or other transparent plastic 4 × 4⅞ inches will be needed. The parts are then ready to be assembled into the completed pocket.

The cotton should be a type that easily separates into thin layers. The celluloid should be fireproof for additional safety in the herbarium. The light-weight grades are quite satisfactory. A suitable material can be obtained by removing the emulsion from ordinary photographic safety cut-film. Cellophane is unsatisfactory.

The assembling of the parts should be obvious from the illustrations. Now, with a pair of scissors, cut notches in the ¾ inch sides at the point where the 4½ inch flap ends (see the illustration). This is to permit the 4½ inch lower part of the pocket to be opened independently of the upper display part.

The celluloid may, of course, be glued to the paper around the opening. In such case, the strengthening layer around the opening is unnecessary. There are several reasons, however, why fastening the celluloid in this way is not wholly satisfactory. Celluloid shrinks and expands greatly in different humidities causing a buckling of the pocket. Also, ordinary celluloid is not permanent but may turn yellow and crack with age, when it may be easily replaced if not fastened in. Too, there is some evidence that certain, perhaps many, fungi and lichens destroy celluloid when in contact with it. For those who wish to fasten the celluloid to the paper, I would suggest the use of acetone spread liberally and rapidly on the paper. The celluloid must be placed in contact before the acetone dries.

When the labeled collection is ready to be placed in the pocket and attached to the herbarium sheet, the pocket is opened, and the label is pasted to the 4½ inch flap, so that the upper margin of the label is flush with the free end of the flap. This strengthens this edge and reduces the danger of tearing. It will be noticed that there is room below the label for annotations. The display portion of the specimen is placed between the cotton and the celluloid; the flap with the opening is brought down into place and, with an ordinary desk paper-stapler, a staple is inserted just below the opening, but low enough so that it will be covered by the label.

The pocket may now be attached to the herbarium sheet, or card for those who use the card-file system. This is done in the usual way by gluing, pinning, or preferably by stapling. Staples are easily inserted and easily removed if the collection needs to be transferred to another sheet, which occasionally needs to be done in all well-kept herbaria.

The rest of the collection is now placed under the flap in the opaque portion of the pocket and the label flap folded into place.

While it may seem that the making of these pockets is a long and laborious process, they are actually rather quickly made. The cost of materials is naturally greater than for the ordinary opaque pockets, but the saving of time in routine identification and the reducing of wear and tear on the ordinary pockets should result in an actual monetary saving in the herbarium.

UNIVERSITY OF MAINE

THE BRYOPHYTE HERBARIUM

A MOSS COLLECTION: PREPARATION AND CARE

BY A COMMITTEE OF THE SULLIVANT MOSS SOCIETY, 1945*

1. *Collecting.* For collecting mosses and hepatics carry a vasculum or handbag, preferably on a strap to hang from the shoulder, leaving both hands free. In this have a supply of small paper sacks (4 to 8 oz.) or envelopes or flat papers 5 x 8 in. to 8 x 10 in. Newspaper does very well. Have a pencil, and a knife with 3-inch blade. A hand-lens, 10 × to 20 ×, should be tied to a strong string and hung around your neck.

The desired specimen, freed as much as possible from dirt, detritus and extraneous bryophytes, is placed in a paper on which is written the habitat of the plant: on what substrate, in what plant community, what exposure, moisture, etc. The specimen thus wrapped is placed in the carrying bag. On a long hike the mosses from one locality, or from each hour or two hour's work, may be put into a large paper bag and carried in a knapsack or taken back to the automobile. Do not hesitate to make several collections of the same species. They may not be the same when critically examined.

All the data about each specimen may well be written in a field notebook as the material is collected, instead of, or in addition to writing on the collecting papers. For each specimen a serial number is put on the paper, and this number in the notebook connects the specimen with the notes.

2. *Care of the fresh specimens.* Arriving at home or laboratory, lay down a standard herbarium drying felt or corrugated board, or both, cover with newspaper, and on this spread out the mosses, each with its number or/and notes. Spread and pat out the plants so as to make thin flat specimens. They may lie thus, exposed, to dry. Or, when one paper is covered lay over it another paper, then a drier or whole newspaper, another layer of mosses, and so on up to a foot in thickness —not more. On top of the pile place *light* weights, not over two pounds in all. Change papers every 24 hours until the specimens are dry. Only *very light* pressure may be used. This is important. The

* REPORT OF COMMITTEE ON HERBARIUM METHODS: The Committee requested by a vote of the meeting of the Sullivant Moss Society held at Cleveland, Ohio, Sept. 13, 1944, has submitted a questionnaire to 21 members of the Society who are ardent collectors of mosses. Based on 18 replies received, and on personal experience of members of the Committee, the accompanying report is submitted. It is not expected that large collections or long-experienced collectors will change their ways, but it is hoped that beginners and all who can readily do so will adopt the plan. We know of one collection of over 5000 packets that has just been so arranged, and a larger one in process. The end result has already proven extremely satisfactory.

shapes and postures of naturally dried leaves and shoots of mosses are extremely characteristic. These characteristics are obliterated if the specimens are pressed hard. When dry the specimens are placed in paper envelopes. Occasionally a very large specimen may be mounted directly on a standard herbarium sheet.

3. *Storage.* Storage of specimens in boxes, card-catalog fashion, is recommended. The box is approximately 6 x 4 x 17 inches, two such boxes to fill a shelf in a standard herbarium case (see paragraphs 4, 5 and 6 below). The envelopes are arranged in taxonomic order by families and genera, following the S. M. S. Checklist. Or, all genera are arranged alphabetically, regardless of families and orders. The species are arranged alphabetically in each genus, and the countries, states and counties are arranged alphabetically or geographically in each species group. Groups are separated by guide cards, preferably with different colors for different countries or regions.

The older collections have the containing envelopes glued, stapled, or pinned to standard herbarium sheets. These are placed in manila genus covers and stored like other herbarium specimens. By placing only one species on a sheet the collection can be kept in available condition. Or an alphabetical card catalog can be maintained and each envelope can be found by means of an accession number. Special collections, such as Sull. & Lesq. Musc. Bor. Am. or Holz. Musc. Acrocarpi, should be kept separate and not incorporated with the general collection.

The insects which are so destructive to herbaria of flowering plants rarely attack bryophytes. Insurance against attack may be had by keeping naphthalene flakes or paradichlorbenzene in each box. The storage boxes should be kept in dustfree and insectproof cases.

4. *Envelopes.* The standard envelope is about 5½ x 4 inches, or width: length as 3:5. Small envelopes must be used for very small mosses (*Seligeria, Ephemerum, Acaulon*) and for small fragments (calyptras); these may be placed inside of the standard envelope, or glued to cards of the size of the standard envelope. Larger specimens, in oversize envelopes, must be stored lengthways or flatways in the standard boxes, or in special boxes, or on herbarium sheets. In any such case a card among the standard envelopes should refer to the oversize specimen. Shallow cardboard boxes 5½ x 4 inches can be placed with the envelopes.

5. *Making the envelopes.* The paper must be folded with two containing sides equal, with an upper flap coming down ⅞ of the width of

the lower flap, and the ends turned back about an inch. See Figure 1. A better envelope is shown in Figure 2.

Directions for Folding

Figure 1. Fold at *d*, bringing *a* up to *g* (1, 2)
Fold at *g*, bringing *c* down nearly to *d* (3)
Fold back about 1 inch at each end, as in 4.

Figure 2. Fold at *d*, bringing *a* up to *g* (1, 2)
Fold *cd* up and in, and the opposite side the same (3)
Unfold *cd* but keep *a* folded; to do this *d* must be unfolded to give the triangular pattern. Do the same on the other side (4)
Fold *c* in again as in (3), giving 5.
Fold *e* nearly to *f*, lacking 1/8 inch (6)

Any dimensions may be used, but *ab* must equal *dg*, and *gc* must be from 1/8 inch to 2 inches less. Let *ec* be 3/4 inch or 1 inch. To make an envelope 5 1/2 x 4 in. the paper must be 10 1/2 to 12 inches long by 7 to 7 1/2 inches wide. The standard sheet of paper, 17 x 22 inch, can be advantageously cut 11 x 7 1/2 or 8 inches, and this makes a good envelope.

The paper used for the envelope should be white, 50% rag or better, and 16 lb. or heavier.

6. *Labeling.* The label is written on the outer flap of the envelope with permanent ink, or typed or printed or mimeographed, or similarly inscribed on a separate slip of 12 or 16 lb. white rag paper, and pasted on the envelope. The separate label will be 4 to 4 1/2 in. x 2 1/4 to 2 3/4 in.

7. *The Label.* Labels should be uniform in content and in sequence of data. Unruled paper is preferred, but such hints as "Loc.," "Alt.," "Lat.," "Long.," "Hab.," "Coll.," "Det.," and the name of the herbarium may be printed in appropriate places. The sequence should be:

1. Name, with authority therefor. Synonym if desired. Name or names of accompanying species.
2. Locality: Country, State or Province; State, County or District; nearest town, place, river, lake, mountain, canyon, etc. Do not use abbreviations.
3. Elevation, Latitude, Longitude.
4. Habitat: substratum, moisture, exposure, plant community, and any other significant or helpful details.
5. Collector's name, date and number.
6. Determiner's name and date.
7. Ownership and accession number.

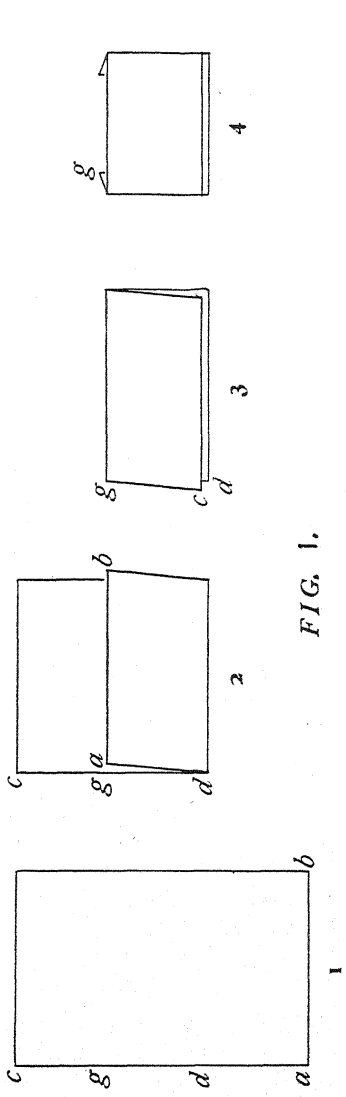


FIG. 1.

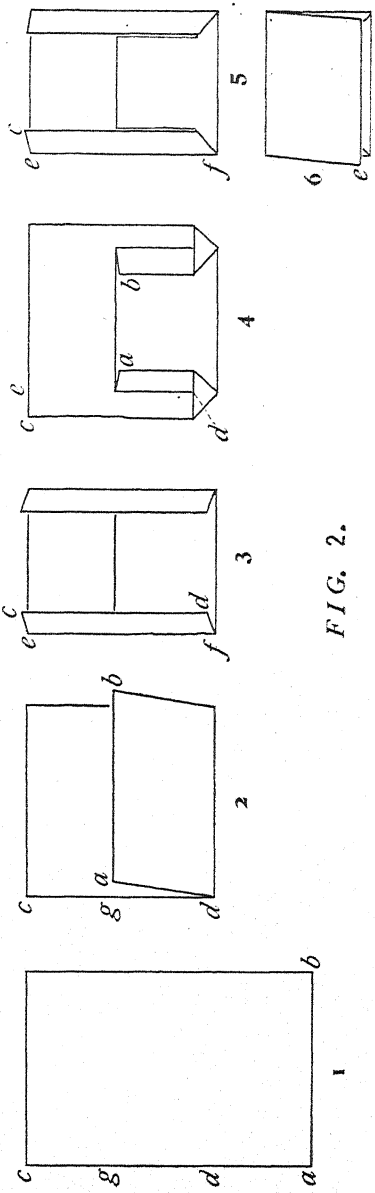


FIG. 2.

FIGS. 1–2. ENVELOPES FOR MOSSES

Model Label:

Dicranoweisia cirrhata (Hedw.) Lindb.
(*Orthotrichum consimile* Mitt.)

WASHINGTON: Chehalis County, Aberdeen, City Park.
Elev. 48 ft. Lat. 46° 50′ N. Long. 123° 50′ W.
On *Picea sitchensis* log in shade, 5 ft.
above ground. Piceetum.
Coll. John Doe. Feb. 12, 1945. 1204.
Det. R. Roe. Feb. 20, 1945.

HERBARIUM OF BLANK UNIVERSITY

COMMITTEE: SEVILLE FLOWERS, PAUL M. PATTERSON,
FRANCES E. WYNNE, HENRY S. CONARD, *Chairman.*

REVIEWS

OSCAR KÜHNEMANN: Géneros de briofitas de los alrededores de Buenos Aires. Contribución morfológica y sistemática. Lilloa (Revista Bot. Inst. "Miguel Lillo") **10**: 5–232. 1944.—Already the author of an impressive catalogue of Argentine mosses,[1] Dr. Kühnemann now presents one of the most important bryological contributions yet published in South America. As Technical Assistant in the Museo Argentino de Ciencias Naturales, the author began to collect and study the bryophytes of the surroundings of Buenos Aires in 1934, and this publication represents the fruit of ten years' work.

The introduction presents a general review of bryological work in Argentina, which has resulted in the recognition there of 1420 native species in 274 genera. The views of the author on the status of bryology in Argentina (pp. 6–7) are so unexpectedly realistic and apply so well to other regions of this hemisphere that they deserve quotation here (in translation):

"Bryology has been so neglected a phase of botany in Argentina that for many years it did not figure at all in the programs of that subject in the institutions of higher education. When he came to our country, P. G. Lorentz, a specialist in mosses, was not able to devote himself to them; nevertheless, because of his deep interest in them, he did collect and send large numbers of duplicate specimens to foreign specialists. This procedure was criticized bitterly by the guardians of the culture of that day, which demonstrates the shortsightedness with which these matters were treated then. Today we should be grateful to that interest for making known the species of our flora to responsible men of science; the publications dealing with Lorentz's bryophytes now form the base upon which any future study must rest, since in them are described some 450 species."

[1] Catálogo de los musgos argentinos. Lilloa **2**: 37–183. 1938.

"This took place in 1879; 64 years have passed and as we may see from the bibliography this group has been treated only in passing by foreign botanists, who left our shores without instilling here a love for this subject, dismissed as useless by the "practical man." The time is ripe to recognize that our own progress, not that which comes to us from abroad, has been slow and that we still do not know, even by name, a large part of the plant species, whether useful or not, which cover this soil."

Following full and well-illustrated chapters on morphology, the author describes 13 families containing 22 genera of Hepaticae and 25 families containing 38 genera of Musci. The composition of the bryological flora of a small, non-mountainous area in latitudes of the Southern Hemisphere corresponding to those of Los Angeles, Memphis, Algiers, and Tokyo in the Northern Hemisphere should be of real interest to northern bryologists. Strangely enough, very few of the genera would be out of place in the southeastern United States. A minor but interesting sidelight on the difference in hemispheres is seen in the admonition (p. 218) that "We find bryophytes growing always on that side of the tree-trunk which faces south."

Nearly all the genera are well illustrated in 91 pen drawings skillfully prepared by the author. Twelve maps show the distribution of most genera throughout Argentina, and the localities actually known are listed under each genus.

The author has been almost too careful in his attempt to maintain this work as a generic flora, and very few specific names appear. Even in monotypic genera the specific names are suppressed, whereas in my opinion at least, the work would have been made much more useful by even a parenthetic mention of the actual species known from the region of Buenos Aires. The illustrations, likewise, would gain more value by an indication of the species which they depict.

The work is terminated by a full and interesting bibliography, a brief chapter on the "Collection and preservation of specimens," a glossary and an index. The glossary is especially useful since many of the botanical and bryological terms used in Spanish do not appear in the dictionaries ordinarily available to us.

We shall look forward to the appearance of the more detailed bryological flora of Argentina which Dr. Kühnemann undoubtedly now has in preparation.—W. C. S.

HERBERT HABEEB: Musci Novi Brunsvici, 1–75. 1945.—Dr. Herbert Habeeb of Grand Falls, New Brunswick, and lately on the faculty of the University of New Brunswick, has issued 75 numbers of Musci Novi Brunsvici—good material, neatly put up, and accurately determined. This set will be particularly useful to amateurs in northeastern North America but also contains some numbers of considerable scientific interest, e. g., *Hypnum fastigiatum* Brid., *Physcomitrium immersum* Sull., *Mnium hymenophylloides* Hüben., and *Fontinalis Duriaei* Schimp.—A. J. GROUT

NOTES AND NEWS

Dr. A. J. Sharp is continuing his "Expedition for Correlation of Flora of the Southern Appalachians and Mexico-Central American Highlands" for a second year, under the auspices of the Guggenheim Foundation. His botanical explorations in Mexico and Guatemala have resulted in the discovery of many bryophytes of unusual interest and significance.

American bryologists and lichenists will welcome the recent appearance of the "Travaux Bryologiques et Lichénologiques" (Paris), edited by Dr. V. Allorge and dedicated to the late Dr. Pierre-Tranquille Husnot. This new bryological journal corresponds to Volume XIV of the "Revue Bryologique et Lichénologique," of which volumes XII and XIII were published during the war and have only recently reached this country for the first time.

Dr. Albert W. Herre (Natural History Museum, Stanford University, California) offers to members of the Sullivant Moss Society, for nine cents postage, the following lichens: *Arthonia impolita* (Ehrh.) Borrer, *Evernia prunastri* (L.) Ach., *Lecanora pallida* (Schreb.) Rabenh., and *Sticta anthraspis* Ach.

We regret to announce the death during the summer of A. H. Brinkman of Craigmyle, Alberta, who was for many years a member of the Sullivant Moss Society. A more extended notice of his life is in preparation.

Dr. H. S. Conard, President of the Sullivant Moss Society, was awarded the honorary Sc.D. by Haverford College on the 50th anniversary of his M.A. from Harvard.

Dr. Paul W. Richards of Cambridge University writes that "We had a very successful meeting of the British Bryological Society a fortnight ago [September] in London, the first we have had since 1939. The society has lost so many of its senior members in the last few years that there is a lot to be done in getting it into running order again, but there are plenty of new young members and plenty of enthusiasm, so I hope before long we shall be active again."

Volume 48, Number 3, containing pages 93–160, was issued October 29, 1945.

INDEX TO VOLUME 48

New scientific names are printed in bold-face type

Illustrations are indicated by an asterisk (*)